Tree growing by rural people

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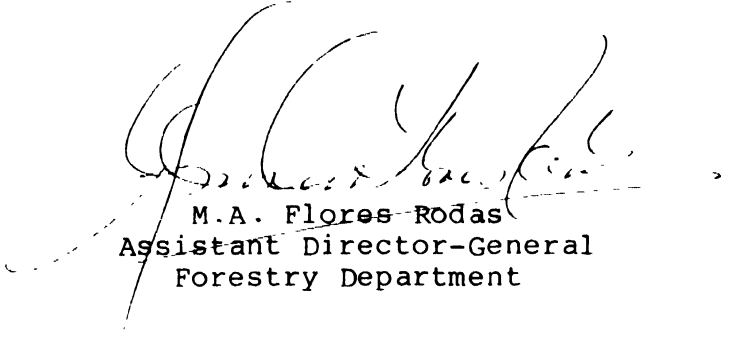
Foreword

This study forms part of FAO's programmes to strengthen forestry activities which directly benefit rural people in developing countries.

The linkages through which rural people draw directly on forests and forest products take many forms, ranging from the use of forest land for shifting cultivation to small processing enterprises based upon raw materials from the forest. Some forest products, such as fuelwood, are essential to meeting people's basic needs. In aggregate it is likely that almost all rural people in non-industrial countries depend on forests and trees for at least some of the inputs into their life systems.

The present study focuses on one of the most important production strategies which meets such needs - tree growing by rural people. With the accelerating depletion of natural forest resources, such local tree growing activities are rapidly increasing in importance as the principal means of maintaining needed supplies of forest products. Over the past few years programmes to encourage and support rural people in these efforts have become one of the principal tasks of forest services.

Considerable experience with such programmes has now accumulated. The purpose of this study is to bring together as much of that experience as possible, and in so doing both to assemble a clearer picture of the different circumstances in which the growing, managing and use of trees and tree outputs is of benefit to rural people and to indicate the most effective ways in which support can be provided.



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The first step in its preparation was an extensive study of the relevant literature, supplemented by field visits, which were undertaken between February and December 1983. This was carried out for FAO by Gerald Foley and Geoffrey Barnard of Earthscan at the International Institute for Environment and Development. FAO wishes to express its gratitude to the many people who contributed material and comments to this initial report. Their inputs are recorded in the Earthscan publication "Farm and Community Forestry" by Gerald Foley and Geoffrey Barnard which is based on the material assembled for FAO.

The report by Earthscan to FAO was circulated to and reviewed and commented on by a large number of persons with specialized knowledge of and experience in the subject. The study was then rewritten within FAO to take into account results of this review and information provided by reviewers. Additional material for Part I of the new version was prepared by A. Peter Castro, Departments of Anthropology and Environmental Sciences, University of California at Santa Barbara; for Part II by Freerk Wiersum, Department of Forest Management, University of Wageningen; and for Part III by Peter Dewees, Institute of Development Studies, University of Nairobi. The new draft was assembled from this material and edited for FAO by Peter Dewees.

This draft was then reviewed in detail by a group of specialists from countries of Africa, Asia, the Near East and Latin America, and from a number of aid entities, at the Seventh FAO/SIDA Expert Consultation on Forestry for Local Community Development held in Rome in March 1985. The final version of the study was then prepared, on the basis of this review, by Peter Dewees together with J. Gabriel Campbell and Gerald Foley.

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Introduction

Though rural men and women have always depended on forests for some of the more important inputs into their life systems, the provision of support to enable them to maintain needed local tree resources received little attention in most countries until quite recently. However, over the past decade, heightened concern with energy supplies, rural poverty, environmental degradation and food shortages have all contributed to a better awareness of the magnitude and importance of the contributions that outputs of forests and trees make directly to the well-being of rural people in non-industrialized countries.

This increased awareness has led to a growing concern as to the impact of deforestation on local availabilities of such needed goods and services of the forest as fuelwood, fodder, food and protection of agricultural land. Under pressure of expanding rural populations, increasing areas of forests are being put under shifting cultivation or cleared for settled agriculture. Tropical forests are being reduced at the rate of about 7.5 million hectares of closed forest and 3.8 million hectares of open forest annually (Lanly, 1982). In addition, forests, and even more the patches of forest, woodland and remaining individual trees outside the forest, are being subject to a variety of other pressures leading to their reduction and removal.

The magnitudes of some of the imbalances between local needs for and availabilities of forest products that are emerging with increasing pressures on forest and tree resources are formidable. It has been estimated, for example, that if present trends in population growth, depletion of forest resources and levels of planting programmes continue unchanged, the numbers of rural people experiencing or facing fuelwood shortages will increase from about 1,150 million in 1980 to close to 2,400 million in the year 2000 (de Montalembert and Clément, 1983).

Though effects of fuelwood shortages have received most attention, other impacts of reduced access to tree resources can be equally if not more severe. Shortages of timber and poles for housing, which requires trees of larger size and better quality than are needed for fuelwood, tend to emerge earlier and more sharply than shortages of the latter. Products of the forest such as arboreal fodder or human foods from particular trees can run short even more rapidly. Probably most serious of all is the environmental damage consequent upon removal of too much tree cover, which in places has reached the point where it threatens the very land and water base of food production. The sharp increase in activity to encourage and support more tree growing to meet local rural needs is thus a response to a number of concerns.

Afforestation programmes to provide rural communities with fuelwood and other forest products are not new. They have usually featured prominently in the activities of forest services, though in the last couple of decades they tended to become overshadowed by the priority attached to industrial plantations. What is new in recent programmes is recognition

that the scope and widespread dispersion of rural needs for local tree cover is now so great that it can only be tackled in an essentially self-help fashion by the people themselves, and that to secure such participation tree growing must be made attractive to them.

Many programmes and projects designed to encourage and support such activities are now in existence. Most are very recent, few having been in place long enough to complete a full cycle of production and use. The process of learning what the requisites are for success in community forestry is therefore still at an early stage. Nevertheless, experience is accumulating rapidly.

This experience has been quite varied. Few of the projects and programmes have evolved in practice precisely as was envisaged at their inception. Even fewer can be judged yet as being unequivocably successful. Nevertheless some actual accomplishments, whether planned or not, have been striking. The village forestry programme in the Republic of Korea resulted in more than a million hectares of local woodlots being planted by more than two million members of upwards of 22 000 village cooperatives in five years. The rapidly growing farm forestry movement in India is by now absorbing more than 1 200 million tree seedlings a year from government sources alone. Many other examples could be cited.

The rapidly growing body of information about what is actually being achieved, and about what is not succeeding, is beginning to provide new insights on tree growing by rural people, making it desirable to attempt a systematic review of this whole area of activity. Prominent among the perceptions that are taking shape are the following:

- rural forestry innovations must be based on an understanding of traditional tree management practices and indigenous knowledge, of both men and women, as well as of what makes introduction of new management strategies necessary;

- rural people usually maintain or grow trees to provide multiple outputs rather than a single product such as fuelwood;

- tree growing and use serve a variety of quite different objectives in different situations, and these need to be pursued through different strategies rather than through a single strategy of "communal" or "farm" forestry;

- tree growing generates different benefits, and costs, to different segments of the community; not everyone will necessarily share equally, or share at all, in the outputs.

This study is intended to help illuminate and clarify these and other lessons that are emerging from experience to date.

The Context of the Study

The study is concerned with one way to maintain or increase local tree resources: the establishment and management of additional or replacement trees by people in that locality as a participatory self-help action. As has been suggested above, only by harnessing local interests and resources can the scale of action needed be achieved. The common feature of all the different experiences reviewed in the study is thus the motivation and involvement of local people who were the principal participants in their planning and execution. The study therefore focuses on this participatory process and on the institutional framework needed to encourage and support it.

It is appropriate at this point to place this type of activity within the broader context of alternative ways of maintaining local supplies of forest outputs. Not all of these outputs need necessarily to be met by planting trees; conservation and management of existing forests and woodland may be a more appropriate response. There is, in fact, reason to suspect that this option is too often overlooked or discarded, or too quickly abandoned, in favour of the seemingly more easily manageable task of establishing a planted resource.

Where planting is needed, not all of it has to be undertaken by rural people themselves. Forest services and other governmental and non-governmental entities continue to account for much rural afforestation. There are, in practice, a variety of intermediate stages between corporate and participatory tree planting which combine local interests with those of a corporate entity. The taungya system of plantation establishment on public land by farmers given temporary access to the land is one. Local government village woodlots established by and on the initiative of the government but designed to meet local needs is another. These are dealt with in the chapters that follow only to the extent that they bear on the issue of involvement and participation of local people. Nevertheless, it should be kept in mind that such options exist.

Another even broader context needs to be considered at this point, that of the boundaries within which participatory tree growing can reasonably be expected to contribute to satisfying needs which have traditionally been met from outputs of the forest. The option of growing trees will not be available to all rural people. Large numbers of people are landless, and a variety of impediments limit access of many of them to land for tree growing; physical and economic factors prevent others from growing trees even when they have access to land; and institutional restrictions exclude yet others from participation. Some people may even be made worse off by the diversion of land to which they previously had access, to tree growing by others.

Not all these constraints and limits are immutable, and clearly one objective of government intervention should be to widen access to benefits to be obtained from trees and growing of trees. Though individual projects and programmes must usually be shaped and take place within a narrower framework, it is important not to lose sight of these broader contexts.

Organization of the Study

The study has been organized with three objectives in mind: to address the context which has made the introduction of rural forestry innovations necessary in the first place; to review different strategies which have been taken to encourage local tree growing; and to discuss programming, planning and institutional issues which have been dominant features of these experiences.

Part I reviews traditions of rural environmental management which balanced the need for trees with other land uses and which have been greatly weakened by growing demographic, social and economic pressures. It examines the need for the introduction of forestry innovations, and suggests that there is a range of responses to tree scarcity. These responses will be dependent on the ability of an existing management system to cope with mounting pressures on trees and on constraints which may prevent people from growing and managing adequate numbers of trees in the first place. The need for interventions of any kind is seldom clearcut. Importantly, there may be opportunities for building on existing traditional management systems instead of introducing radically new silvicultural strategies.

Part II discusses various approaches that have been adopted in developing participatory tree growing and management activities. Different strategies are required to meet the different objectives people pursue through tree growing, to reflect different patterns of ownership and control of land and tree resources, and to accommodate local institutional arrangements for their management. Three main strategies of community forestry are defined: tree growing carried out under collective management or the management of communal organizations, tree planting and management at the level of the individual farm to provide outputs for household or family use, and farm level tree growing to produce cash crops.

Part III covers the broader framework of government support services and of the institutional setting within which most communal and farm forestry activities will function. Specific issues in programming, planning and design which are discussed include economic analysis in the project preparation process, the farmer's perspective of tree growing in the rural agricultural economy, the need for monitoring and evaluation of rural forestry programmes, institutional arrangements, and extension and education approaches. Also covered are the role of forest services and of non-governmental organizations.

The wealth of experience reported in the study reflects an extraordinarily diverse range of situations in which people are growing trees. One aim of the study has been to define broad classifications of systems and strategies. At the same time, each situation has proven in some measure to be unique, and needs to be dealt with individually. There are no universal prescriptions that can be applied to every programme. Each must be defined and structured in terms of the particular needs, aspirations and possibilities of the people involved - and of the broader framework of local and national institutions and

policies. This study is thus not a manual nor does it attempt to prescribe particular courses of action to be followed. However, it is hoped that it will provide a body of knowledge to assist those concerned with programmes which support rural both men and women people in their tree growing and to help them to define, plan and manage such programmes.

With the future on his shoulder

Produce from trees

Part 1

Trees in the rural context

Chapter 1

Traditions of tree management and cultivation

Rural men and women in many areas have long been involved in the conservation and cultivation of trees on agricultural lands and forested areas. Until recently, there has been a tendency to discount these indigenous activities. The main focus of forestry efforts has been on management of trees for environmental protection or for industrial timber production. The shift in emphasis toward forestry in partnership with rural people is, therefore, a significant departure from earlier perceptions, policies and practices.

In order to set present community forestry activities, both communally and privately organized, within the context of local spontaneous tree growing, it is necessary to review a number of indigenous tree management and conservation strategies. The relationship between rural people and the trees in their environment is generally complex. Many of the approaches used have been developed over long periods of time. Often they have emerged as responses to increasing, though sometimes subtle, pressures on the local environment. Their underlying function has been to ensure that locally-valued tree species continue to be available to rural people.

The extent to which people cultivate and manage trees varies throughout the non-industrial areas of the world. It depends largely on characteristics of local ecology, patterns of agricultural land-use, cultural traditions, local demands for wood and wood products, tenure rights and economic pressures.

In some societies, tree cultivation and management is a major feature of the way of life; in others, it has assumed a peripheral or even a negligible role. Depending on the intensity of the management approach, different strategies will be able to withstand more environmental stress than others. Environmental degradation and the depletion of tree cover is sometimes symptomatic of a lack of comprehensive traditional tree and environmental management systems. In many cases, it has been the result of the breakdown of traditional systems because of intense and interracting pressures.

Introduced innovations may be required where strong indigenous traditions do not exist. In heavily forested areas, and in some regions of the world where alternative resource-use strategies have been pursued, tree conservation and regeneration strategies may be largely absent. Similarly, pressures of poverty, population growth and insecure tenurial rights -- among other factors -- have sometimes precluded the development or retention of indigenous strategies.

Ultimately, rural tree planting programmes should be based on understanding any traditional or existing tree cultivation or

management systems which these programmes may supplement, as well as on understanding what has made the introduction of new methods of rural tree management necessary in the first place.

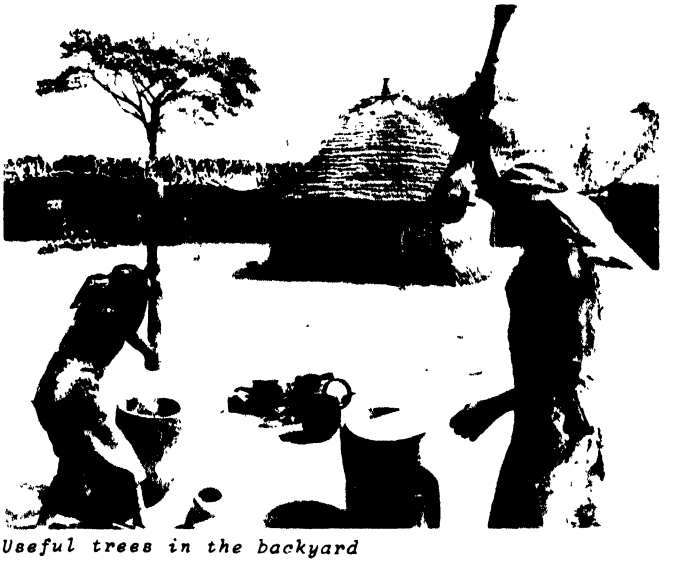
1.1 The Importance of Trees

Trees provide wildlife habitats

The world's forests have an undisputed and vital role in sustaining natural and human environments. They protect watersheds, provide habitats for wildlife and help to stablize otherwise fragile ecosystems. They provide many essential products for rural and urban dwellers. They also play an economic role, with the commercial extraction of timber and pulpwood producing significant amounts of national income and foreign exchange in a number of countries.

In addition, forests provide a home and a means of livelihood for large numbers of people, both traditional forest dwellers and those who find employment in extracting and harvesting commercial forest products. Forests also play a vital role in agricultural production. Although shifting cultivation has been a cause of the deterioriation of much forested land, when it is practiced in an environmentally sustainable way, the natural process of regrowth and regeneration of the forest restores the fertility of fallow land.

Although not as well documented, the role trees play outside established forested areas and reserves is also critical. Trees, dotted about the rural landscape, around houses, along field boundaries and roadsides, and in communal grazing areas, are seldom recorded in the formal statistics of forested lands. But for the majority of the rural population, living away from the immediate vicinity of forested lands, these trees have an even more significant role than the forests themselves. Therefore, policies and programmes intended to improve access to wood resources and other tree products must be based on a recognition that the trees which will be most useful to these rural people will not be found growing in the forests, but in their own backyards, on smallholdings and on communally held lands.



Useful trees in the backyard

In farmlands and grazing areas, trees also play a vital environmental role. They act as windbreaks, protecting crops from wind damage and the soil from erosion. Their shade helps to reduce the temperature of the soil. Tree litter slows down the run-off of rain, thereby protecting the soil and increasing the infiltration of water so that groundwater stores are replenished. Trees also redistribute nutrients, drawing essential minerals from the subsoil and making them accessible, through their leaf-fall, to other plants. In many countries, tree litter is collected in large quantities for composting and mulching in order to maintain soil fertility.

Trees have a valuable social function. They provide shade for people and animals in hot climates, and are sometimes a focal point for family and community gatherings and activities. There are many places where trees are grown and protected for their shade and beauty; sometimes they are treated as sacred.

1.2 Tree Products

The usual method of cooking

Wood is the most widely used household fuel in non-industralized areas of the world where supplying energy, in fact, constitutes the greatest demand for wood, far exceeding that of commercial timber. Wood is by far the most important energy source in many countries, accounting for up to 90 percent of the total fuel used in some of the poorest. In many countries, virtually every rural family uses it for at least some cooking and food processing and for heating. In many cities, charcoal and wood remain the predominant cooking fuels. Some industrial processes such as tobacco and tea curing, brick firing and beer brewing often rely entirely on wood for process heat. Restaurants, tea shops, bakeries and other commercial enterprises add to these demands.

However, the dominant role of wood in rural energy supplies should not be allowed to obscure the fact that other traditional fuels are often important. Use of agricultural residues and animal dung is extremely widespread, though since it is poorly understood it is not given the attention it deserves. The result has sometimes been that the case for fuelwood programmes has been overstated because the contribution that other traditional fuels make has not been taken fully into account.

The dominance of woodfuel demand in quantitative terms has also tended to obscure the vital importance of other tree products to rural people. Animal fodder is perhaps one of the most significant of these, especially at certain times of the

year when grass and other feed sources are unavailable. In arid areas, trees often provide regular supplies of fodder in the form of edible seed pods and leaves. During times of drought, these become especially important sources of animal feed.

Trees can provide fodder

A wide range of human foods are also obtained from trees and from forested areas. Some of these are extremely important in preserving the nutritional balance in traditional diets. They include edible leaves and pods, roots, fruits, nuts, honey, insects, and game. Trees may be a source of food condiments, such as spices, and sap from some trees is used to make wine. Mushrooms and other forest funghi are also collected for certain types of dishes.

Mushrooms can grow on trees

Trees produce a large number of what are often referred to as "minor" forest products. The importance of these products should not be underestimated. They make a vital contribution to the needs and general living patterns of large numbers of rural people.

Many communities rely on trees to provide fibre to make ropes, mats, baskets, snares, coverings, woven goods and even musical instrument strings. Trees are an important source of many herbal remedies and traditional medicines. Tannins and dyes extracted from tree bark and seed pods are used to cure leather and colour fabrics. Oil from the seeds of certain trees can be used as a substitute for paraffin in hurricane lamps. The leaves and twigs of other trees have good insect repellant qualities, are used to stun fish or serve as natural livestock dewormers. Some resins can be used as glues.

Basket making - a family business

Agricultural implements, bullock carts and boats are often crafted out of wood, and certain varieties of wood are highly-valued for their tool-making qualities. The trunks of some trees are hollowed out for water storage. African woods are used to make camel bells.

A boat crafted from wood

Trees also supply a variety of commercial construction materials. Building poles, for example, are widely needed for a variety of purposes. In rural areas, they are used in construction of many traditional types of dwellings; in cities, poles are used by the poor in constructing low-cost housing, and larger poles are extensively used for scaffolding and for props by the building industry.

Harvesting and distribution of these tree products is an important income-generating activity in many areas. Charcoal production and fuelwood vending, for instance, are a vital source of income for many poorer rural households. Other jobs are generated by pitsawing, operation of sawmills, woodworking, tree farming, and the gathering and selling of fruits, timber, resins, gums and other forest products both for cottage industries and for larger scale commercial concerns. The significance of small-scale rural enterprises which process forest materials is gradually becoming better documented. In a recent survey, FAO has shown that such enterprises are often one of the largest sources of off-farm employment and income. Further work is now in progress to determine the key characteristics of such enterprises and to formulate ways to enhance their economic contribution (FAO, 1985a).

The role of trees in the patterns of rural living is thus both complex and diverse. Focusing on one aspect, even such a major one as fuelwood, at the expense of others can be gravely misleading. So much of the fabric of rural domestic and farmir life relies on trees that any diagnosis of the problems arisinc from the depletion of tree cover which does not take into accoi the full complexity of this dependence is likely to be inadequate.

1.3 The Role of Tree Management and Cultivation

Almost everywhere, a certain standing stock of different types of trees, whether deliberately cultivated or allowed to grow naturally, has been recognized as necessary by farming communities. Even in nomadic pastoralist societies, trees have traditionally played a variety of essential roles. Though pastoralists may rarely have planted trees, their traditional way of life was such that they did not usually deplete the supply in the territories over which they ranged with their flocks.

Indeed, the grazing animals helped maintain the tree base by dispersing tree seeds over wide areas.

The many products and benefits which rural people derive from trees reflect detailed and sophisticated knowledge about their immediate environment. The assumption that traditional communities are unaware of the benefits provided by trees, and therefore need to be educated about the immediate consequences of the depletion of tree cover, is rarely accurate.

Local impacts such as the loss of fodder, shade, fruit, and other benefits are obvious. Although rural populations may not have a clear understanding or perception of the long term consequences of deforestation - particularly downstream consequences - their ability to name and distinguish a large number of species and to describe their characteristics demonstrates awareness of trees and the role they play in their own lives.

In some cases, rural silvicultural systems are highly sophisticated with considerable numbers of trees planted and well-developed techniques used for managing and harvesting them. Elsewhere, managing tree resources is more passive and relies on conservation and natural regeneration. Stability of the system rests on the fact that population pressures are low and that the forest's capacity for regeneration is great enough to offset any damage done by the utilisation practices of rural people.

Where traditional societies have remained stable, they have generally been able to maintain the productive role of the tree resources on which they depend. Though traditional tree management strategies might slow or even stop the processes of environmental deterioration, the primary focus has usually been on the utility value of trees for household or community use. Some practices have resulted in developing elaborate agroforestry systems, such as home gardens, which have incorporated indigenous trees into sustainable production systems. Others have been more modest in scope and effect, based on the desire to retain at least some valued trees conveniently near the household.

1.4 Traditions of Tree Protection and Management

Restricting access to trees is one means by which individuals, households or kinship groups may assert exclusive rights to them. The use of the baobab in southern Niger, for instance, is defined by very old traditions which specify strict proprietary rights. In Sudan, palm trees may be subject to a complex system of fractional ownership defined by traditional laws of inheritance. In Western Sumatra, the decision to cut a valuable tree is made by the extended family (Fortmann, 1984).

A baobab tree - protected by tradition

Some communities have long protected specific trees because they provided a focal point for the community, occasionally because of their religious significance. In Nepal, formal management systems were developed by some communities over a period of centuries. These systems defined specific users' rights to valued products from trees growing on common lands. The systems were as much a response to distributional demands as they were to growing scarcities. As some of the older systems broke down, visible recent increases in the rate of forest destruction prompted some communities to establish new systems (Campbell and Bhattarai, 1983).

Other groups of people with common interests in tree resources have also been responsive to the threat of growing scarcities. In the highlands of Guatemala, professional woodworkers have been a particularly strong force in pushing for tree conservation efforts. The Chipko Movement in the Himalayan region of India is a communal effort with active leadership from women, which has relied on the Gandhian technique of non-violence to protect trees from destruction by commercial timber concerns (Agarwal & Anand, 1982).

The Karen people of Thailand have customarily tried to contain swidden plot fires (Kunstadter, et al., 1982). Among particular tribal groups in Kenya, honey collectors are obliged to prevent fires when smoking out bees (Leakey, 1977); and in some areas of India, cutting down a tree may be considered unethical, especially if it yields products which are of use to the community. Among the Bora Indians of the Peruvian Amazon, there is a recognition that their system of shifting cultivation must be managed in a way which both reduces soil erosion and favours particular trees in secondary vegetation (Deneven, et al., 1984).

In addition to active tree conservation efforts, some local land management strategies have consciously matched demands on the land with its carrying capacity. In these areas, it is clearly recognized that overgrazing results in environmental degradation; the size and grazing patterns of livestock herds are therefore kept within environmentally acceptable limits.

Other strategies for managing tree resources have involved protecting and cultivating naturally germinating seedlings. Cultivators may leave certain desirable tree seedlings when weeding and even build barriers around them as a protection against grazing livestock. In parts of southern Mexico, farmers tolerate and protect indigenous leguminous trees, such as Prosopis, which provide edible pods, shade and enhance soil fertility (Wilken, 1978). Cultivators in southern Nigeria recognize the superiority of certain species in restoring soil fertility to fallow plots and encourage them to dominate the bush (Getahun et al., 1982).

A Prosopis providing fodder

A recently emerging management strategy has been to restrict peoples' access to trees previously available to them. This approach is usually associated with changes in systems of land tenure and may be a response to worsening wood scarcities. In central Kenya, the collection of wood or of other products from trees growing on private lands has increasingly required the permission of the property owner, although until recently, trees and their products have been free goods (Brokensha and Riley, 1978).

1.5 Coppicing and Pollarding

Coppicing and pollarding are techniques which can be used in managing certain types of trees. Coppicing involves cutting the tree down to its stump and allowing it to regrow; it normally sends up a number of shoots instead of the original single stem. Pollarding involves cutting off the crown of the tree, leaving it to send out new branches from the top of the remaining stem; this also has the advantage that the new shoots are high and therefore more apt to be protected from animal and fire damage. Vertical pollarding is the close pruning of branches along the stem. Regrowth after coppicing and pollarding is vigorous because the tree's root system has already been well established.

A variety of different pollarding, coppicing and pruning techniques have been reported in many parts of the world, for instance in Bangladesh, Burkina Faso, the Philippines and Rajasthan, India (Douglas, 1981; Wiersum and Veer, 1983; Ben Salem and Tran van Nao, 1981).

Pollarding - a rational tree management practice

B. RILEY

Vertical pollarding

It has been reported that in the highlands of Kenya the pollarding of Grevillia growing on agricultural lands is common. Intense pollarding of these trees may be carried out 15 or 20 times over a period of 50 years. The trunk will continue to widen, and the stem will increase in height unless this is deliberately prevented by pruning at the top. Whenever the farmer decides that it is large enough or that he needs the money, the trunk is felled and is sold for timber (Poulsen, 1983).

What these techniques all have in common is that they permit a sustained yield of wood or fodder over a long period of time. The total lifetime contribution of a tree which is used in this way can be considerably greater than the volume it will produce if it is simply allowed to grow and is then felled.

The fact that coppicing and pollarding techniques are widely employed by farmers has often been overlooked. In some areas, however, it is clear that their use enables an overwhelming proportion of the fuelwood or timber needed by households to be obtained on a sustainable basis from trees growing on agricultural land. This has important implications for the design of programmes to maintain increased fuelwood supplies.

1.6 Traditions of Tree Planting and Cultivation

In many countries, rural people traditionally plant trees for a multiplicity of household uses. In Bangladesh, one of the most densely populated of all countries, it was found in 1983 that on average each household had planted or naturally regenerated 68 trees, of which 16 had been established in the previous year (Byron, 1984). In the area of Fatick, Senegal, it has been found that virtually all households had planted trees.

In Panama, fruit trees are planted on almost every small farm (Jones, 1982b). Nearly half of the farmers interviewed in the Valle Occidental region of Costa Rica said that they had planted trees as windbreaks (Gewald and Ugalde, 1981). In Peru, spontaneous private tree plantings account for around 30 percent of all trees planted, even though the government only sponsors large-scale reforestation. A survey in the hill area of Nepal showed that on the average each household owned 28 trees, around a third of which had been planted and cultivated (Campbell and Bhattarai, 1983). Of rural households in the Kakamega District of Kenya, nearly 40 percent maintain small nurseries and nearly 80 percent have planted trees on their land (van Gelder and Kerkhof, 1984).

Perhaps surprisingly, there are few reported cases where rural people have spontaneously planted trees specifically for fuelwood, except where they intend to sell it. In Kenya, for example, it has been found that people plant trees for fruit, to provide shade or ornament, to create windbreaks, or to mark out boundaries (Brokensha, et al., 1983).

In Malawi, large numbers of farmers plant trees, mainly for poles to be used by the family. Only 15 percent of the people

interviewed in a study of tree planting practices planted trees for fuelwood (Energy Studies Unit, 1983). In spite of heavy demands for rural energy supplies, Indians living on Bolivia's Titicaca plateau felt that trees were too valuable to be used as fuel; they used them mainly for house posts and for other objects of material culture (Barre, 1948).

Although trees are seldom planted specifically for fuelwood, there is still an awareness that they will help to supplement available energy supplies for the household. Trees which are planted for use as timber or as construction poles, for instance, must be trimmed in order to make sure that they grow straight; fruit trees must be pruned occasionally if they are to produce better quality fruit. These cuttings can be used as fuel. Building poles which have been replaced at the end of their useful life are also used as fuel.

In a few areas, however, there are established traditions that involve the planting of fuelwood for commercial markets. Around the Indian city of Madras, casuarina plantations were originally established in the late 19th century to provide wood for the railways, but were used for household energy when the railways were converted to coal. During the Second World War, when acute fuelwood shortages developed, local farmers seized the opportunity to plant trees for the urban fuelwood market. The practice still continues, and similar plantations also exist around other South Indian cities. In several areas of Java, farmers have responded to increased commercial fuelwood demands by planting large areas of Calliandra (National Research Council, 1983).

Trees have also been cultivated to provide numerous products for other specific markets. Tree products such as gum arabic, rubber, coconut, dates, palm oil, coffee and tea are vitally important elements in the economies of many developing countries. Cultivation of these trees is not confined to large plantations, as they also provide cash incomes and a means of livelihood for large numbers of smallholders and limited resource farmers.

Rubber - trees for a specific market

Commercial timber species are also cultivated by farmers. For many years the match-making industry in southern India has been based largely on smallholder tree growing. Some companies distribute free seedlings to ensure a steady future supply of wood. Sometimes trees are seen as a method of long-term insurance. In parts of Latin America, it is common for farmers to plant a few trees around their dwellings to be cut and sold for timber when money is needed. In Turkey, trees are traditionally planted to celebrate the birth of a female child as a kind of "down payment" on her wedding.

1.7 Traditional Agroforestry Systems

In many areas, rural people have combined tree growing with a variety of agricultural and pastoral activities on the same plot of land (Combe and Budowski, 1979; Lundgren, 1982; Nair, 1984; Weber and Hoskins, 1983). In general, the most widespread benefit from this type of systematic tree-pasturage-crop combination is the soil enriching effect of the trees.

An additional benefit is obtained from the protection against erosion. The total productivity of the land is also increased by the fact that these systems permit a supplementary or complementary use of different layers of the soil and of the space exposed to sunlight above the surface (Arnold, 1983).

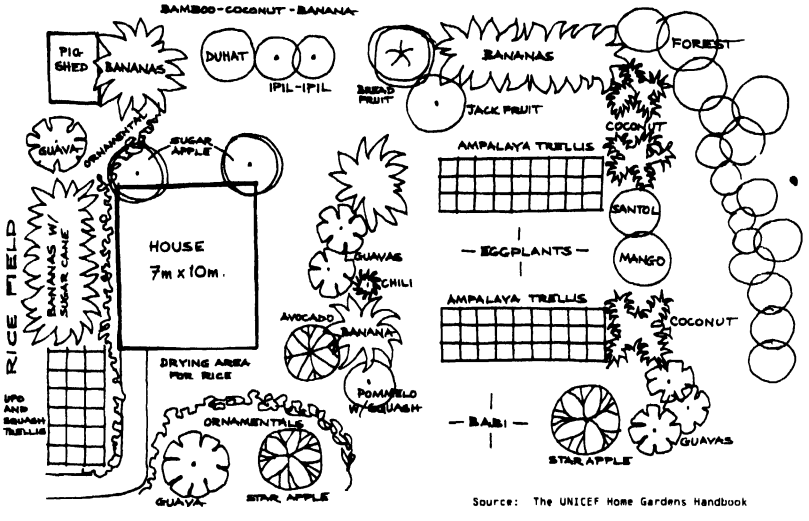
The types of practices and their productive outputs vary widely. Cultivators in arid zones of Rajasthan, India, intercrop fodder and grain crops with Prosopis cineraria. In the case of the failure of their other crops, Prosopis becomes a main source of fodder; leaves and seed pods are stored for livestock in anticipation of lean periods. The wood is used for charcoal and fuelwood and for making agricultural implements (Paroda and Muthana, 1981).

Cordia alliodora is used as a canopy tree over coffee and cacao in the humid lowlands of tropical America. Its predominance is so great that it has been estimated to be the third most widely grown tree in some areas, even though it is not recorded in any statistics of tree plantations (Budowski, 1983). In much of the Sahel, naturally germinating Acacia albida is allowed to grow in fields in order to improve the soils (Weber and Hoskins, 1983).

Acacia albida - a useful tree

Where population densities are low and land is abundant, fallow periods can be long enough to allow shifting cultivators to practise a successful type of agroforestry. By leaving some trees in swidden plots and encouraging the growth of soil-enriching trees and plants, some shifting cultivators have played a direct role in maintaining local tree cover and speeding up the fallowing process. Among Lua cultivators in Thailand, 84 varieties of plants and trees were found in swidden plots, including 70 that provided food and 13 species with medicinal uses (Kunstadter, 1983). Swiddeners in Sumatra leave fruit trees and hiving trees for bees (Pelzer, 1948). Shifting cultivators in the Peruvian Amazon have been found to favour certain commercially valuable timber species in fallow plots (particularly cedar) in anticipation of substantial cash returns for their children (Deneven, et al., 1984).

Among the most elaborate systems of indigenous agroforestry are the "home gardens" of Southeast Asia, Latin America and Africa.



Source: The UNICEF Home Gardens Handbook

Traditional agroforestry the home garden

These gardens usually have a multi-layered mixture of a large number of food, fodder and wood producing species grown in close association. They are commonly grown in small plots located close to individual dwellings and are very carefully tended; frequently, they are also used for keeping poultry and small animals. Basically, home gardens imitate or recreate the multistoreyed structure and species diversity of forests; this allows a simultaneous combination of perennial and annual crops in a small area.

The diversity of species which are grown in home gardens results in a wide range of products. Because the crops have different biological cycles, a household is usually able to harvest some produce on a daily basis, even if in small amounts. On plots as small as a tenth of a hectare in Central America, perhaps 25 or more varieties of food plants and trees have been found, including coconuts, papaya, bananas and coffee (Wilken, 1978). A study of home gardens in Indonesia, which cover around 20 percent of the arable land on the island of Java, revealed 37 species of fruit trees, 11 species of food-producing plants, 12 medicinal species, 21 herb species, 18 vegetable species, 45 species of decorative plants and 47 species of plants used for fuelwood and for construction -- all growing at a single site (Wiersum, 1984; Atmosoedaryo and Wijayakusumah, 1979).

A number of swamp or moist-land cultivation systems incorporating trees have much in common with home gardens. The chinampas system has been used in parts of Mexico for hundreds of years. Raised platforms are constructed, and sediments from the bottom of swamps or from specially constructed reservoirs are used to grow a wide variety of annual and perennial crops. Fruit and other trees which provide shade, support for vines and other products are planted along the edges of the platforms or are interspersed with plants growing on the platforms themselves (Gliessman, et al., 1981). A similar practice is found in the deltaic plains of Bangladesh where villages rest on groups of mounds as protection against seasonal flooding. Multistoreyed plants, shrubs, bamboos, palms and other trees are grown in these fertile alluvial soils (Douglas, 1981).

On the lower Tana River in Kenya, farmers plant a number of plots with different annual and perennial crops in order to minimize their environmental risk. Although a few plots might fail during a given planting season, because of the different agro-ecological conditions in each plot and the variety of crop demands, the likelihood of total crop failure is minimized. Usually, plots are set aside specifically for fruit, fuelwood and local construction materials.

Agroforestry systems have often developed in areas of high population density as a response to land shortage. If, however, landholdings become too small as a result of demographic, economic or political pressures, the limits of adaptability of the system may be reached and short-term solutions adopted. Trees which had been grown in a complementary relationship with other crops may be uprooted in order to make room for the crops necessary for subsistence. It has been found that in areas where average landholding sizes have substantially decreased, farmers often revert to the production of just a few staple crops such as cassava (Wiersum, 1984).

1.8 Tree Management Practices in Perspective

Traditional strategies for managing tree resources are dynamic by nature. They have developed as responses to particular situations, reflecting a variety of cultural, social, economic, political, ecological and demographic factors. Where they have survived successfully, they have often been able to accomodate the introduction of new agricultural crops, the growth of populations, the expansion and contraction of market opportunities for particular crops and other factors.

However, the fact that rural people have, in the past, been able to manage their tree resources effectively does not necessarily mean that they can continue to do so. Increasing economic, demographic and social pressures have contributed to the breakdown of traditional tree management practices in many areas. The more passive systems which rely principally on the natural regenerative capacity of forests and woodlands have been particularly vulnerable; in some areas they have been completely overwhelmed.

In order to understand the context for the successful introduction of rural forestry innovations, it is necessary to understand why people are constrained from planting and managing adequate numbers of trees in the first place. Equally and perhaps more important is an understanding of why natural forests and trees growing on and around farmlands, which formerly were able to meet the diverse tree-based needs of rural people, are no longer able to do so.

Table 1 Some examples of prominent agroforestry systems and practices in the developing countries

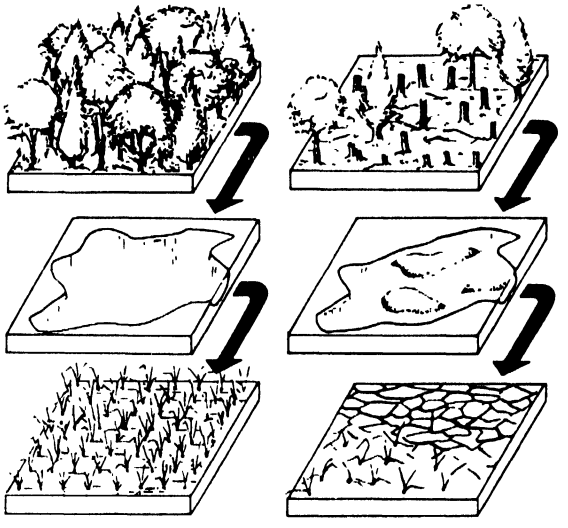
Prominent Systems	SYSTEMS AND PRACTICES IN DIFFERENT GEOGRAPHIC REGIONS					
	S.E. Asia	S. Asia	Mediterranean & Middle East	Eastern, Central & Humid West Africa	Arid & Semi-Arid West Africa	American Tropics
Agro-silviculture	1. Commercial trees among crops 2. Fruit/shade trees along crops 3. Live fences 4. Shelterbelts 5. Taungya 6. Shifting cultivation systems 7. Intercropping in plantation crops (rubber, oil palm, coconut)	1. Taungya 2. Plantation crops + arable crops 3. Commercial trees and fruit trees with crops 4. Live fences + shelterbelts 5. Various trees on farmlands for productive functions 6. Various forms of shifting cultivation 7. Medicinal plants + agri. species	1. Olive + cereals (on terraces, "banquettes", "cuvettes", etc. 2. Poplars along irrigation canals 3. Trees for sand dune reclamation 4. "Huertas" - small plots, irrigated crops + fruit trees 5. Aromatic, medicinal and fruit trees with crops	1. Taungya 2. Cacao/food crops/ forest complex 3. Plantation crops (oil palm/rubber) and root crops complex 4. Coffee + banana 5. Mixed perennial crops 6. Gum arabic + millet 7. Shifting cultivation/bush fallow systems	1. Use of trees on farmlands for protective role (windbreaks, dune fixation) 2. Productive + protective role of trees on farms (A. albida/ Leucaena + agric. crop systems	1. Trees in perennial cash crops (coffee, cacao, tea) 2. Trees for organic matter and mulch with annual crops 3. Tree live fences 4. Windbreaks and shelterbelts 5. Trees as support for climbing commercial crops 6. Taungya 7. Shifting cultivation systems
Silvo-pastoral	1. Pasture in forest plantation 2. Pasture in secondary forests 3. Commercial trees in pastures 4. Fruit/shade trees in pasture 5. Fodder trees 6. Coconut + pasture	1. Pasture under trees 2. Plantation crops + cattle grazing 3. Fodder trees + shrubs 4. Fruit trees + commercial trees in pastures	1. Oak forest + grazing 2. Pig breeding + forestry 3. Rangeland improvement	1. Gum arabic + livestock 2. Plantation crops (coconut/cashew) + pasture	1. Nomadic/semi-nomadic/trans-human 2. Sedentary livestock grazing systems/browsing systems 3. Fodder tree/shrub systems	1. Trees in pasture 2. Pasture in natural regeneration forest 3. Trees lopped for fodder 4. Trees used for browsing
Agro-silvo-pastoral	1. Crops + grazing in plantations 2. Agri tree crops + grazing in forest plantation 3. Multipurpose trees with crops/animals 4. Integrated forming systems with agric. plantation crops (rubber, coconut, oil palm)	1. Plantation crops + arable crops + livestock 2. Agric. tree crops + grazing in forest	Rangeland management	1. Coconuts/other plantation crops + food crops + grazing 2. Coffee + banana + dairying 3. Horticultural complex systems	1. Forestry dominating (forest lands) 2. Agriculture dominating(crop lands) 3. Livestock dominating (rangelands)	1. Agric. plantation crops (coconut, rubber, fruit trees) with crops and pastures
Home gardens	Various forms of multispecies combination	1. Multistorey plant canopies in humid regions 2. Arid/semi-arid systems	Mainly in large cities	Various forms	Various forms	Various forms
Others	1. Silviculture in mangrove forests 2. Agri-silvi-fishery 3. Trees on bunds in fish breeding ponds 4. Swidden farming 5. Fuelwood agroforestry	1. Mixed perennial 2. Irrigation systems 3. Various site-specific systems 4. Fuelwood systems	1. New system in Morocco (spice plantation for erosion control) 2. Apiculture + forestry 3. Fruit trees in deserts 4. Mushroom cultivation in forest	1. Pastoral systems with corral farming (highland/ lowland interactive systems) 2. Mixed perennial cropping	1. Oasis 2. Irrigation systems 3. Various site-specific systems	Mixed perennial

Source: P.R. Nair, Soil productivity aspects of agroforestry, ICRAF, Species for Energy Production, National Academy of Sciences, Washington, D.C., 1984.

Chapter 2

Pressures on traditions of rural tree management and on tree and forest resources

Tree scarcity is the outcome of both long term and recent processes and events. In some places, pressures have been building up gradually and almost imperceptibly. Where pressures build little by little, people have sometimes had time and opportunity to evolve and adapt management systems. In these cases signs of scarcity might have been present for decades, but adaptive stretegies such as the protection of valued trees, the encouragement of volunteer seedlings and selective thinnings may have prevented acute manifestations of deforestation from developing. In other cases, however, the loss of tree cover has tended to accelerate.



Agricultural impact of deforestation. Eroded forest soil silts up a lake feeding an irrigation system. Reduction in the lake's water capacity means a reduction in the land area that can be irrigated and so cultivated.

The dimensions of the problem are complex and are made more so because of the changing aspirations and expectations which have accompanied economic development. Population growth is often regarded as the main driving force behind deforestation, but it is certainly not the only factor. It needs to be seen in relationship to agricultural development, markets, government policies, settlement patterns, technological change, past patterns of tree and resource exploitation, and alterations in the socio-economic structure of rural societies.

The over-exploitation of trees and their resultant scarcity are usually symptomatic manifestations of larger problems which have accompanied the development process -- and which are often poorly understood and oversimplified. Sometimes people have abandoned tree conservation practices simply because they are no longer consistent with their perception of the rural agricultural economy. An understanding of the reasons for the breakdown of active and passive adaptive tree management strategies is necessary before interventions to remedy them can be effectively implemented.

2.1 Fuelwood Gathering and Deforestation

Fuelwood gathering is sometimes seen as the major cause of the depletion of wood resources. This is rarely so; other and more destructive forces are usually at work as well. This is not to say that the need for fuelwood is not a potent element contributing to the collapse of traditional wood resource

management systems in some areas; where wood demand exceeds natural regeneration, over-cutting is the likely outcome.

Fuelwood is being carried further and further

This imbalance is particularly apt to be the case in the vicinities of cities and around other areas of concentrated demand for wood. For instance, virtually all the trees on common or unprotected lands within a radius of 40 kilometers of Ouagadougou in Burkina Faso have been cut for fuelwood, and the circle of depleted resources is still expanding (National Academy of Sciences, 1980; Chauvin, 1981). A recent FAO study suggested that acute fuelwood scarcities are already being encountered in eighteen African countries, three Asian countries and six Latin American countries, affecting about 112 million people (de Montalembert and Clement, 1983). (Urban fuelwood shortages are, in fact, nothing new. During his travels in Niger in 1795, the explorer Mungo park noted that the countryside for two miles around the city of Kaarta was stripped of wood by the great consumption of that article for building and fuel.)

2.2 Need for Agricultural Land

It is widely recognized that clearing land for agricultural cultivation and for pasturage is the primary reason why people cut down trees (Bajracharya, 1983; Allan, 1965). Within the agricultural economy, extending the area of land under cultivation may well be the cheapest and easiest method of increasing production. However, clearing forests for alternative land uses is not restricted to agriculture. In Costa Rica, large areas of the lowland forests have been cleared to make way for commercial livestock grazing (DeWalt, 1982). Many Latin American and Southeast Asian countries have had legal policies of encouraging resettlement of forest areas for both agriculture and livestock production.

The role of overgrazing in preventing natural regeneration is one of the most important factors influencing the disappearance of trees. Although historical evidence from the Middle East and elsewhere suggests that this is not a new problem, grazing pressures have increased tremendously over the last several decades. These pressures have been hardest felt in arid and semi-arid areas where, until recently, natural forests were able to recover from the effects of grazing. However, pastoralists, with their cattle and other livestock, have now settled in areas where nomadic people formerly grazed their herds. In these circumstances, previously sustainable strategies for grazing and fodder collection have rapidly broken down -- to the detriment of both the forests and the people who depend on them for their livelihood.

Other changes in the structure of agricultural production have similarly had a destructive impact on tree cover. Farmers in Puebla, Mexico, who have adopted high intensity tractor cultivation no longer maintain leguminous trees in their fields because commercial fertilizers produce higher yields over the short-term and because the trees get in the way of their tractors (Wilken, 1978). The use of higher intensity methods of farm and pastoral production in semi-arid areas of Rajasthan, India, has resulted in a decreased reliance on conservation measures such as crop rotation, long fallow periods and the seasonal migration of livestock. In some areas, such as the peanut basin in Senegal, these short-term, high production strategies are being reexamined as residents are finding that high production is unsustainable unless accompanied by conservation of the resource base.

2.3 Changing Patterns of Land Ownership and Control and the Emergence of Commercial Markets

In rural areas where there is not enough land to absorb growing agricultural populations, pressures on the already cultivated land become even more intense. Through inheritance, the division of property among family members and land sales, average landholding sizes decrease. As the resources available to the household decline, trees may be seen as a resource which must be sacrificed to meet more urgent household needs.

In Sudan, Acacia senegal trees which provide gum arabic are being cut as the fallow system under which they were grown is being abandoned because of land scarcity (Horowitz and Badi, 1981). Trees may be seen as a hindrance to the farmer because they compete for water and nutrients and because shade slows crop growth. In some parts of Kenya, people have been pressured into cutting trees because neighbors complained that shade damaged their crops (Castro, 1984).

With increased pressures, many traditional land tenure arrangements and customary practices which defined land-use rights have been greatly weakened. Smallholders who have had their access to wood resources on adjacent lands blocked because of changes in the traditional structure of land-use rights may find that they are forced to utilize the trees on their own property more heavily. In other cases, where there has been a tradition of land borrowing, but where settlement pressures have increased, landowners may discourage planting trees because of the fear that tenants will attempt to assert a personal claim to the land.

Where farmers have no long-term guarantee on the use or control of the land they farm, there is little incentive to make long-term investments in improvements such as tree planting. In Honduras, where 80 percent of the rural population is landless, it has been found that very few farmers plant trees or living fences, in part because of the lack of security of tenure (Jones, 1982a).

Government programmes have also contributed to the depletion of tree cover in some areas. For instance, indigenous tree management practices among the Karen people of the highlands of

Thailand are being destabilized to some extent by reforestation projects in the swidden cultivation areas, thus reducing the amount of land available to them (Kunstadter, 1983).

The nationalization of forest land in Nepal (Bajracharya, 1983) and Honduras (Jones, 1982a) for protective reasons has had the unintended consequence of decreasing local incentives for tree protection. In Latin America, the development of roads for forest industries has opened up previously unpopulated areas to colonization. After logging has been completed, farmers occupy the land and the forest does not regenerate.

Commercializing formerly free wood products such as fuelwood can also increase the pressure on wood resources. This is particularly evident near urban areas where commercial demand may be especially strong. In Nigeria, farmers who clear trees from their fields usually sell them for fuel (Morgan, et al., 1980). Where trees are planted for commercial use, such as pole wood, availability to poor residents of either poles or fuel as a free good may lessen as the wood is exported to markets.

Local over-exploitation of trees for commercial purposes must be understood within the context of both the urgent need in urban areas and the lack of income generating opportunities in rural areas. Fuelwood collection and charcoal production can provide a means of earning a cash income to people who have few other opportunities available. Even if they recognize the damage that their activities are causing, they have no alternative way of making a living. Indeed, one argument against the development of peri-urban fuelwood plantations in Kenya has been that they will reduce the incomes of those who have been involved in the sale of fuelwood and charcoal.

2.4 Local Constraints to Tree Growing

Sometimes, even where trees are especially scarce, rural people may be unwilling to grow them. It is unlikely that the reason for this is an ignorance of the benefits of trees or of the techniques used for cultivating them; it is far more likely that there are other real and serious constraints.

It has been suggested (cf. Burley, 1982) that the major conditions which must be satisfied before rural people will plant trees are :

-- Economic: There must be sufficient land, capital and labour resources available to make tree growing possible and to cover the expenses of planting, cultivating, harvesting, and marketing trees and their products. The benefits of tree cultivation and management, both in economic and financial terms, must exceed the net benefits from alternative resource and agricultural management strategies, as well as the costs of production.

-- Social/Cultural: Changes in productive relationships and in the pattern of resource ownership which might be brought about by tree cultivation must fall within culturally

accepted strategies for resource distribution. The perceived social value of trees, or of specific types of trees, must coincide with values which adaptive management strategies or interventions might impose. Further, appropriate and culturally sensitive technical expertise must be available.

Technical expertise must be culturally sensitive

-- Environmental: Interventions or adaptive strategies must be responsive to the availability of water, to temperature regimes, to soil types and to other characteristics of the natural environment.

It must also be recognised that many farmers do not see any reason for planting trees. Tree products may still be widely available, either legally or illegally, from communal lands or nearby forest reserves. The fact that over-exploitation could eventually lead to the total depletion of tree resources may appear to be totally beyond their control or, at the very least, irrelevant in the time scale within which they are able to plan their lives.

In order for farmers to divert resources to tree planting, there must be a local perception of scarcity. This may manifest itself through lengthened times for fuelwood collection, the need for economies in fuel use, or even reductions in cooking. In addition, tree growing must be seen as an appropriate response to these pressures. Where life is characterised by urgent general scarcity of daily necessities, planting trees for future use may not appear as a particularly relevant endeavour.

2.5 Lack of Control Over Use of Land

The most favourable economic environment for tree growing exists where trees are clearly for the ultimate benefit of those who plant them, or for their children. Conversely, the absence of land tenure security or control over the use of land resources is often a major constraint to tree growing.

In many parts of the world, rural people have no clearcut control over the land they farm. Some patterns of land tenure have been obscured by changing practices overlying a base of centuries-old traditions which have previously defined communal or individual user's rights. Farmers, particularly the poor, lack legal tenure to their land and face the constant threat of expulsion. Even tenant farmers cannot be expected to plant trees if they are unsure of whether or not they might be evicted in the foreseeable future. This problem of lack of security to land access is often especially acute for women.

Security of land tenure in itself, however, may not be a sufficient incentive for people to plant trees. Farmers able to satisfy their own needs from the existing stock of trees on their own land may ignore the landless who may be acutely aware of their own shortage of wood yet have no means of responding to it (Bruce, et al., 1984).

In some Latin American countries, land tenure laws, far from encouraging the cultivation of trees, create a positive incentive for their removal. People can gain land rights by moving into forested areas, clearing the trees and planting crops. Their claim to land ownership becomes stronger the longer they successfully farm the land. Conversely, in areas where tree planting may establish tenure, this may also act as an impediment. In the 1940's, the Basotho chiefs of Lesotho discouraged tree planting in order to restrict ownership, and the prohibition has carried over to present times (Fortmann, 1984).

Cleared for pasture - what next?

Grazing rights may conflict with the requirements of tree growing, irrespective of the pattern of land ownership. In many countries, land is used by different people during different seasons; animals are traditionally allowed to roam freely on farmers' lands after the harvest. This serial tenure pattern makes the protection of privately planted trees an extremely difficult task, as it means that those doing so must infringe upon what others in the community may view as their rights (Raintree, 1985).

2.6 Lack of Control Over Use of Trees

Even if land tenure is secure, there is also the question of who controls tree resources or tree tenure. Patterns of tree tenure can be quite complex, but generally involve the right to own or inherit trees, the right to plant them, the right to their use and the right to disposal (Fortmann, 1984).

In Haiti, rural people have been told that all trees belong to the government and that anyone cutting a tree would be punished. Although the intent was to ensure that the trees would be protected, the reverse was often the case. Rural people felt threatened because they assumed that the government's interest in the trees could eventually lead to the expropriation of any land with tree cover.

Until recently, commercially valuable tree species in India and Nepal belonged to the government, regardless of on whose land they grew. These included trees such as khair (Acacia catechu) which produce tanning extracts and pine trees (Pinus roxburghii)

which produce resin. Farmers had to wait for the forest department to harvest the trees or, alternatively, could purchase them and obtain a permit for cutting them down.

A recent Tree Conservation Act has been enacted in India which lists a large number of trees which cannot be cut without a permit. These protective regulations, while helping to check illegal removals from the forest, have undoubtedly inhibited smaller farmers from planting trees. In order to benefit from tree planting, they must go through the laborious and often expensive process of acquiring cutting permits. This has also been a feature of forest legislation in the Sahel (Thomson, 1979).

Resin producing pines - government property

2.7 Competing Uses for Land, Labour, and Capital

Where tree growing is seen to be one of several possible alternative land uses, the trade-offs between these must be considered. For instance, the use of agricultural lands for commercial tree growing has been widely criticized because of the displacement of food crops. In areas where agricultural land is available in abundance, the same argument can be made about virtually any cash crop. However, the use of agricultural land for tree growing in on-farm block plantations may be an especially serious problem where lack of land has already constrained agricultural production. In these cases, there may be reason for active public interventions to discourage tree growing in favour of other essential commodities.

The risks in tree growing vary among landholders. If smallholders are going to plant trees, they will probably have to change the pattern of their already intensive use of the land. If their production of food crops is diminished, the risk they have taken in planting trees increases accordingly. Even if fast growing trees have been planted, it may be four or five years before they are able to reap the benefits of their investments. In the meantime, they have to be able to finance their daily needs which would otherwise have been met by farm income, however meagre.

Owners of larger landholdings are not subject to the same constraints. They will still have sufficient land on which to plant food crops, and their short term risks remain much the same as before they planted trees. If planting trees means that they must finance other needs while waiting to harvest their trees, they are also much more likely to be able to obtain the necessary credit because they have collateral available in the form of land.

The availability of labour may also be a constraint to tree growing. Trees need to be planted at the same time as demands for agricultural labour are highest. In arid areas, where hardpan layers must be penetrated after the first rains in order to allow a seedling to get properly established, or in other areas where the planting season is short, labour demands may be particularly high during the planting period. Seasonal migration patterns may also reduce the availability of on-farm labour after annual crops are harvested but when trees continue to require maintenance and protection. In subsistence agricultural societies, the idea of hiring additional labour, even if it is available, may be completely foreign.

At the same time, the creation of labour surpluses as a result of tree planting can also be a problem. Annual agricultural crops which require regular yearly cycles of planting, cultivation and harvesting have very different labour demands from tree crops. The timing and labour requirments of planting, thinning and harvesting trees are spread out over a number of years and thus require much less total labour.

Motivation for investing resources in tree planting may also be low where there are no accessible markets for any remaining tree products which exceed subsistence requirements. Similarly, difficulties in managing commonly used resources and lack of appropriate rural institutions to do so may constrain communities from engaging in afforestation of common lands.

2.8 Social and Cultural Constraints

Assuming land, labour and capital resources are available for tree growing, other constraints may discourage tree planting. These can arise from cultural traditions. In some areas certain types of trees are associated with malign spirits and taboos. In the Casamance region of Senegal where the forestry service encouraged planting cashews, rural people burned the trees to evict the evil spirits which these trees are reputed to shelter.

In parts of India, tamarind trees have a similar reputation. There has been speculation that planting introduced exotic trees has the advantage that they do not have the same unfavourable associations for local people as do indigenous species. Forests, in fact, are often associated with theft, murder and danger from wild animals. In many former colonized countries, especially in West Africa, older residents also associate tree planting with forced labour and the fear of punishment should the trees die.

Other practical reasons may deter people from planting trees. In some African countries, the usual method of controlling the spread of the tsetse fly is to cut down the trees which harbour the insects. The practice has been reinforced by education and extension efforts over a long period, and trees have come to be seen as a threat to the well-being of rural people. In other places, farmers object to trees which grow near their fields because they provide a haven for seed-eating birds. Trees may also compete with adjacent crops for water, light and nutrients. These attitudes are in many cases perfectly

reasonable, but will obviously frustrate the success of tree planting interventions unless they are accompanied by complimentary strategies which provide a compensating increase in overall benefits.

Finally, it is sometimes difficult for interventions to be responsive to certain needs due to traditions which may appear to be completely unreasonable when taken out of their context. The baobab is highly valued for its multiple uses and products in southern Niger; proprietary use-rights are generally well-defined and clearcut. One might perhaps assume that because these trees are so highly valued, it would be relatively easy to stimulate their widespread planting. It has been found, however, that this is virtually impossible, largely because of the perception that these trees are a divine gift. A farmer who grows baobabs faces the risk of tampering with the divine course of events.

2.9 Constraints or Opportunities?

Some of the processes that have contributed to abandoning tree management systems have also resulted in planting trees: the trend toward land privatization, a growing desire by rural inhabitants to increase productivity and to raise their income levels, the active response to commercial incentives, the greater involvement of governments in resource management and rural development, and the development of markets for wood.

Perhaps the greatest difficulty in focusing interventions to promote tree growing by rural people lies in the need to understand differences in patterns of human behavior. Are these patterns constraints or are they instead opportunities upon which productive interventions can be built? Often planners go ahead with what they think best and then sit back in surprise when their ideas and efforts are rejected. "Target groups" are classified as "backward" or "bound by tradition."

The challenge comes in identifying the real constraints and finding effective means to overcome them. Innovations should never be construed as replacements for existing indigenous systems of tree management and conservation, but rather as a means of building upon local strengths and capabilities. Effective design and introduction of forestry innovations ultimately require an understanding of where these activities fall within the spectrum of people's spontaneous responses to scarcity. This will only come with direct two-way communication between project planners and rural people, and a collaborative effort to devise methods by which the most appropriate innovations might be effectively introduced.

Chapter 3

Introducing rural forestry innovations

Active and publicly-supported programmes to stimulate tree management and cultivation date back at least 2,000 years. Early Chinese rulers encouraged people to plant trees for food production and for lumber. At one point, the government granted public lands to peasants who would reforest them. In the 1500s, rulers in Sri Lanka set aside land for shifting cultivators and prohibited clearing timber from other protected lands for a proscribed period of 30 years (Seth, 1981).

China: 2000 years of tree growing

Ethiopia provides an historical example of a publicly-initiated tree growing programme to promote the production of fuelwood for urban areas. In the late 1890s, the Ethiopian Emperor Menelik introduced legislation to exempt land planted with trees from taxation and arranged for the distribution of introduced eucalyptus seedlings at nominal prices. This was a response to an extreme scarcity of wood around the new capital of Addis Ababa, which had been established in 1890. Although the tree growing program was slow to start, by 1920 it was reported that "the streets and paths of Addis Ababa began to look like a vast continuous forest" (National Academy of Sciences, 1980). By 1964, the area of eucalyptus forest around Addis had reached 13,500 hectares.

Other publicly-initiated tree planting activities have been started by local rulers and have had far reaching effects. In 1932 in the Amarasi region of Timor in Indonesia, local government regulations obliged shifting cultivators to plant rows of Leucaena along the contour lines of their swidden before abandoning them. Other regulations set aside areas for grazing, for other types of farming, and encouraged planting fruit trees. Eventually, this area which had been heavily degraded by overcultivation was transformed into a food exporting region . (Metzner, 1983).

In the community of Muquiyauyo, in the Peruvian Andes, eucalyptus trees were introduced by a Catholic priest in the late 1870's because the area had suffered from a lack of trees. A local committee was appointed to acquire more trees, and local work projects were organized to plant them in the town and along

roads. The activity spread as people appreciated eucalyptus wood, using it in house construction, for making implements and furniture, and as firewood. The mining industry around the turn of the century provided a ready market for support props. Although eucalyptus was not seen as the best tree for construction, it was widely used because it was fast growing and cheaply available. Town dwellers also felt that trees added visibly to their community's beauty (Adams, 1959). Organized planting continued at least through the 1930s, with some seedlings being raised locally and others being imported from other towns.

Eucalypts - frequently appreciated exotics

The spread of neem trees (Azadirachta indica) in West Africa and the Sahel is another striking example of the successful introduction of a new tree species in the more recent past. It was introduced into Senegal in 1944 and into Mali in 1953. In other parts of West Africa it was widely used by the forest services for roadside plantings. Highly valued for its rapid growth and its production of multi-purpose timber and tree products, it is one of the most commonly planted trees in the region, and the demand for seedlings still remains high (Taylor and Soumare, 1984).

3.1 Initiatives during the Colonial Period

During the extended period of colonial expansion in the Nineteenth and Twentieth centuries, there were numerous efforts to introduce tree cultivation and management systems. The main focus of these efforts was on forest protection and reservation.

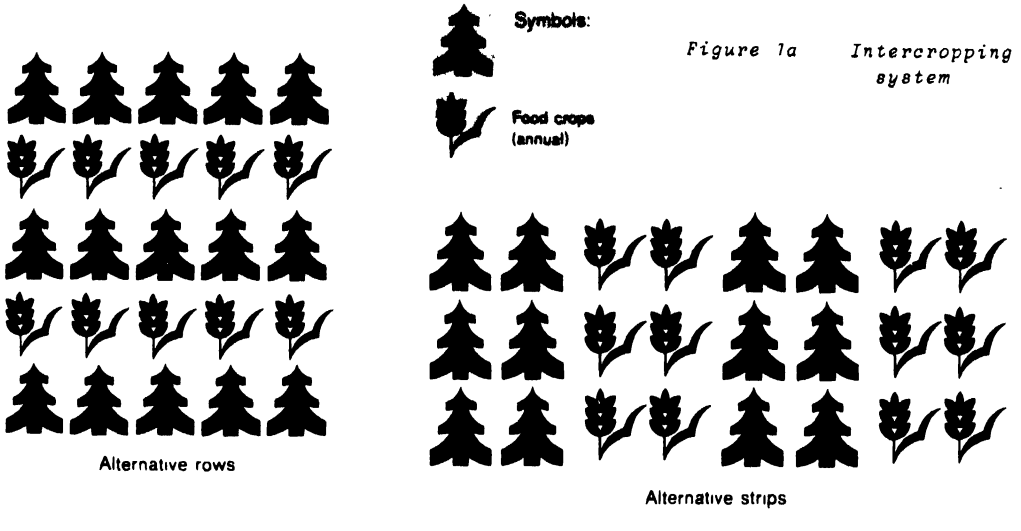


Figure 1a Intercropping system

The taungya system was widely used as a means of reforestation. It originally started in Burma in the mid-1800s, where it was introduced as a means of controlling shifting cultivators and of growing teak on a large scale. In this system, farmers planted seedlings along with food crops in cleared plots. After a few years, during which farmers weeded and cultivated the seedings as they farmed, the trees began to shade the land, and farmers moved to another part of the forest where the cycle was repeated. Taungya, which soon spread to India, East Africa and elsewhere, has been favoured by foresters because it is a relatively inexpensive means of planting and weeding, and because it permits the multiple use of forested lands.

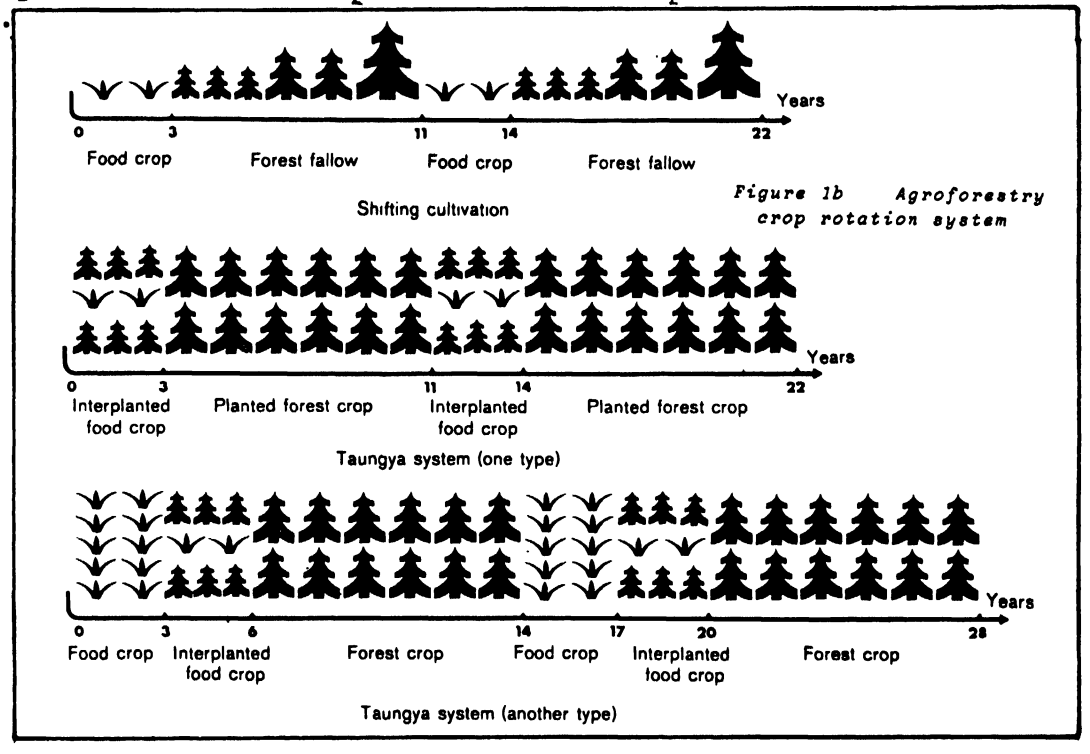


Figure 1b Agroforestry crop rotation system

However, raising food crops in combination with trees is frequently more labour intensive after the first year than traditional systems of shifting cultivation which taungya replaced. For these reasons, successful taungya plantations have tended to be associated with areas which are characterized by under-employment, low living standards and shortages of agricultural lands (King, 1968). In these conditions, the system has been used to save public expense in planting and weeding of plantations while temporarily providing landless labourers with an opportunity to obtain employment and produce their own agricultural crops.

Among taungya's drawbacks are that it is sometimes seen to be exploitative of the landless poor (Seth, 1981). When it uses their labour without providing any long-term access to land, it does little to stabilize already insecure systems of land tenure. In fact, fear that taungya workers will mobilize political support to obtain permanent tenure rights to agriculture production sometimes inhibits more widespread use of this system (Ball and Umeh, 1982). Project failures have sometimes been blamed on sabotage by land-poor farmers, who, fearing to be displaced when the trees grew, damaged the seedlings.

Introduction of tree crops, along with development of international markets for tree products, has probably had the greatest impact of all the colonial tree cultivation interventions. Although plantation-style management of tea, rubber, cacao, coffee and other tree crops was favoured by colonial agricultural services, smallholders quickly adopted these cash-producing crops as well. Often, this occurred in spite of official pessimism about farmers' ability to incorporate these trees efficiently into their agricultural production systems.

Market incentives favoured introduction of rubber trees

In Indonesia, government officials were originally of the opinion that Hevea rubber could only be properly cultivated in large estates. Nonetheless, swidden cultivators quickly incorporated rubber trees into their systems, partly because of high market prices for rubber, but also because of encouragement and seed supply from Chinese traders. Recent studies have indicated that some swidden rubber cultivation practices in Indonesia have been found to be superior to plantation management practices (Pelzer, 1982), and the government is now actively promoting smallholder cultivation.

There are a number of other less successful examples of colonial forestry activities at a community level, initiated as a response to growing scarcities of trees. During the mid-1920's, a village forestry scheme promoting the protection of indigenous forests was introduced by the colonial forest service in Malawi. Communal forests were established and placed under the jurisdiction of village leaders. The fact that communities traditionally set aside bush areas for protection raised expectations that the scheme would be successful, but it was viewed with suspicion by villagers because they feared land alienation.

In Kenya, the government initiated several soil conservation and tree planting campaigns. However, by the late 1940s, soil conservation measures had become immensely unpopular because they represented a cornerstone of the colonial government's land policy. The Mau Mau emergency period disrupted tree planting activities, and years passed before its former momentum was regained.

Some of the problems encountered with tree planting interventions in the past were peculiar to the colonial situation: local people resented foreign initiatives; they distrusted government motives; they feared further land alienation. Coercion was all too often used as a means of implementing projects. Even now promoting tree growing by rural people is never likely to be an easy or straightforward process, especially in those areas that need it most. People have cut

down trees where they live for reasons which are strong and valid. However compelling the imperatives for tree growing may appear at the national level, people will only take part in these activities if, from their perspective, they are both feasible and attractive.

3.2 The Role of Rural Forestry Innovations

Where tree growing is a feasible and attractive option to rural people, there may be no need for the introduction of new silvicultural practices. Both women and men may be planting and managing trees in ways which continue to meet their needs despite demographic and economic pressures. The most promising approach in such cases may well consist of simply "fine tuning" the existing system, but even then, planners must be prepared to question whether more complex management techniques will necessarily improve the current methods being used.

The need for interventions is all too often taken for granted. A recent evaluation of a smallholder tree-farming project in the Ilocos province of the Philippines linked farmer non-participation with deficiencies in the project design; there was criticism of the programme's publicity, extension and marketing on the grounds that they failed to address the farmers' needs adequately (Hyman, 1983a).

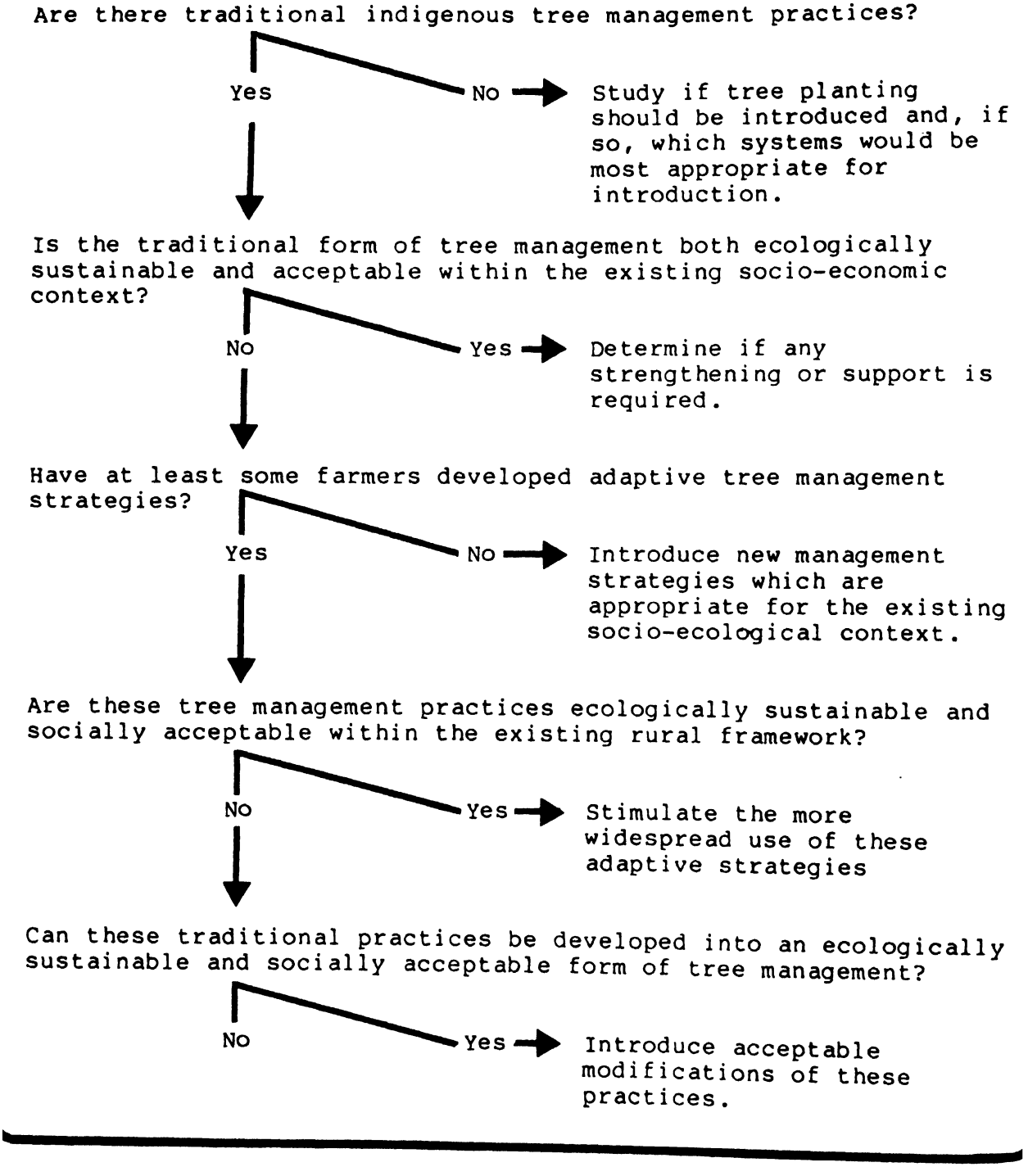
Closer examination showed that the faults were more basic. The project had been intended to produce fuelwood for tobacco curing, yet no prior evaluation had been made of the real demand for this wood. In fact, farmers in the area had already planted a large number of woodlots on their smallholdings to supply this market and were hesitant to change their successful management practices. The existence of these woodlots had largely gone unrecorded, although they appear to be very productive. They usually consist of mixed stands predominated by Gliricidia sepium which, planted on deep soils and yearly coppiced, can yield as much as 40 cubic metres/hectares/year (Wiersum, 1983).

This example serves to illustrate that the development of interventions to address apparent shortages of wood or tree products should be based on a careful examination of the local context. Rather than assume from the start that interventions or innovations are necessary, an evaluation of existing local tree cultivation practices will provide a useful means of identifying appropriate interventions in a particular rural context. The framework for such an analysis might resemble that given in Figure 3.1.

It must be emphasized that introduction of new tree cultivation and management strategies is only one type of response to a scarcity of tree resources. The spectrum of alternative responses ranges from doing nothing to introducing radically new rural silvicultural prescriptions. Between these two extremes lie numerous possibilities for designing strategies to increase efficiency of existing rural tree management and wood production systems.

Figure 3

Analysing the Need for the Introduction of Innovations in Tree Management


Are there traditional indigenous tree management practices?
Yes
No
Study if tree planting should be introduced and, if so, which systems would be most appropriate for introduction.
Is the traditional form of tree management both ecologically sustainable and acceptable within the existing socio-economic context?
No
Yes
Determine if any strengthening or support is required.
Have at least some farmers developed adaptive tree management strategies?
Yes
No
Introduce new management strategies which are appropriate for the existing socio-ecological context.
Are these tree management practices ecologically sustainable and socially acceptable within the existing rural framework?
No
Yes
Stimulate the more widespread use of these adaptive strategies
Can these traditional practices be developed into an ecologically sustainable and socially acceptable form of tree management?
No
Yes
Introduce acceptable modifications of these practices.

Part 2

Strategies to encourage local tree growing

Chapter 4

Identifying strategies for communal and farm forestry

Over the past decade, a large number of programmes have been launched to promote tree growing by rural people. Although many of these field projects are still in their early stages, much has already been learned about the potential of various types of programmes and the problems of introducing them.

Objectives set for programmes and methods of implementing them have varied widely. Some programmes have placed tree growing objectives within a broad and ambitious social and environmental framework. Others have been intended to encourage tree growing by individual farmers, and the primary objective has been to increase the production of wood and other tree products for household consumption or for commercial markets.

Community involvement often has been seen as a means of widening the range and distribution of tree growing benefits by bringing public and community land into productive use and by involving landless people and the poor. Strengthening local institutions and generating employment have also been among the explicit objectives of many programmes.

A joint effort for trees

The differences between programmes have thus been considerable. Even so, from the experience to date, distinct strategic approaches can now be identified, each with its own specific potential and limitations. At the same time, these should not be construed as mutually exclusive. Combinations of various basic strategies can be, and often are, developed within a programme or a region.

4.1 Identifying Programme Objectives

Any strategy which is intended to stimulate tree and forest management by local people must, of necessity, be based on a well-defined and consistent set of objectives. In the past, many rural tree growing schemes have been launched under the name of "social forestry" or "forestry for local community development."

Generally, social forestry is a term used for any type of industrial, conservation or community forestry project which tries to maximize benefits for residents. Community forestry falls under this umbrella. The term community forestry was defined in 1978 by a group of international experts in a way that continues to be accepted.

> "Community forestry has been defined ... as any situation which immediately involves local people in a forestry activity. It embraces a spectrum of situations ranging from woodlots in areas which are short of wood and other forest products for local needs, through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities. It excludes large-scale industrial forestry and any other form of forestry which contributes to community development solely through employment and wages, but it does include activities of forest industry enterprises and public forest services which encourage and assist forestry activities at the community level. The activities so encompassed are potentially compatible with all types of land ownership. While it thus provides only a partial view of the impact of forestry on rural development, it does embrace most of the ways in which forestry and the goods and services of forestry directly affect the lives of rural people." (FAO, 1978)

Gradually it has been recognized that even the community forestry label is generic and that the social development norm of such forestry projects does not refer to one specific objective, but rather to a group of objectives. A number of broad aims can be distinguished. Generally, these projects have been intended to:

provide the means so rural families can supply, or have better access to, certain basic needs in the form of essential forest and tree products;

increase the participation of the rural people in managing forest and tree resources as a means of increasing their self-reliance;

use human resources to better manage degraded and marginal lands thereby counteracting the process of deforestation and environmental degradation;

contribute to the general socio-economic development of rural people through employment generation, institution building and promoting economic growth;

Seedlings to meet people's needs

-- help meet the needs and aspirations of both women and men in specific underprivileged groups within the rural population, such as subsistence farmers, migrant herders and the landless;

-- increase the overall production of wood or other tree products to counter growing deficits.

It should be recognized that although some of these different objectives may be congruent or may reinforce each other, at times they may be conflicting. For instance, when denuded and over-utilized agricultural lands are reforested for environmental improvement, the production of tree products may well be limited by poor growing conditions. Consequently, such schemes may not be financially attractive for smallholders interested in the production of commercial tree products. Even if smallholders do involve themselves in growing trees to meet specific market demands, it may be difficult to achieve participation, especially of poor and landless people. As a result, a given project may have an inconsistent impact among different sectors of the rural population.

Planting together

It should be realized, as well, that some objectives can be met by planting individual trees in backyards while other objectives require establishing forested areas as complete and well functioning ecosystems. For example, the production of wood or fodder or fruit takes place in individual trees, even if they are standing alone; in contrast, the environmental value of a forest depends on the proper functioning of a concentrated stand of trees as an ecological unit. Even planting trees on private fields may require community agreement for the community-wide control of animals or fire.

Thus, in identifying the objectives and strategies for programmes which involve rural people in forest and tree management, it is essential that project outputs and intended beneficiary groups be identified and linked in an internally consistent project design. Under many circumstances there may be trade-offs between effective contribution of tree management schemes to general socio-economic development and efficient creation of specifically needed forestry outputs. It is essential that each proposed project component also be analyzed separately in terms of the objectives it can realistically be expected to meet.

The relative importance of multiple objectives of local tree management schemes will, in the end, be determined by various socio-economic, political and environmental conditions. A proper

analysis of these factors is a prerequisite for developing strategies which stimulate local tree growing. The role of policy makers and planners is to establish broad development objectives as well as clear-cut priorities for the use of capital and labour resources for rural forestry so that programmes can be developed which have underlying and basic consistencies. Programmes must identify issues of vital concern to rural people - how land is to be used and protected, what sectors of society should benefit from development activities, and how forest-based needs of rural people are to be met - and then must provide adequate support to address these issues.

4.2 Types of Community Forestry Development Strategies

In addition to the proper identification of programme objectives, several other factors must be considered before developing strategies which encourage local tree growing or other social forestry activities (see Figure 4.1). Closely connected with the identification of a project's objectives are two related questions. First, who are the individuals or institutions with primary management responsibilities? Second, how is the control, use or ownership of trees and of land resources defined and organized?

Broadly speaking, the control of tree and land resources belongs either to the community (including communal groups), to private groups such as households and individuals or to the public sector. The extent to which any of these groups have control is defined by complex legal and institutional arrangements, traditions, cultures, conditions of class and systems of tenure.

Ultimately, a programme's design will define tree management responsibilities. These responsibilities will characterize the type of development strategy which is pursued, although they will likely be affected by characteristics of land and tree ownership and control. Outside of public sector managed activities, primary responsibility for land management and for tree planting will lie with the community or communal groups and with individuals and households.

4.3 Definitions and Strategic Approaches

From the experience to date, three broad approaches to community forestry activities can be distinguished. These can be classified under the following headings:

- Communal forestry
- Farm forestry for household use
- Farm forestry for the market

Within each of these categories there is a considerable range of flexibility in goals and operating methods. Nevertheless, each has important distinctive features.

Table 2.1

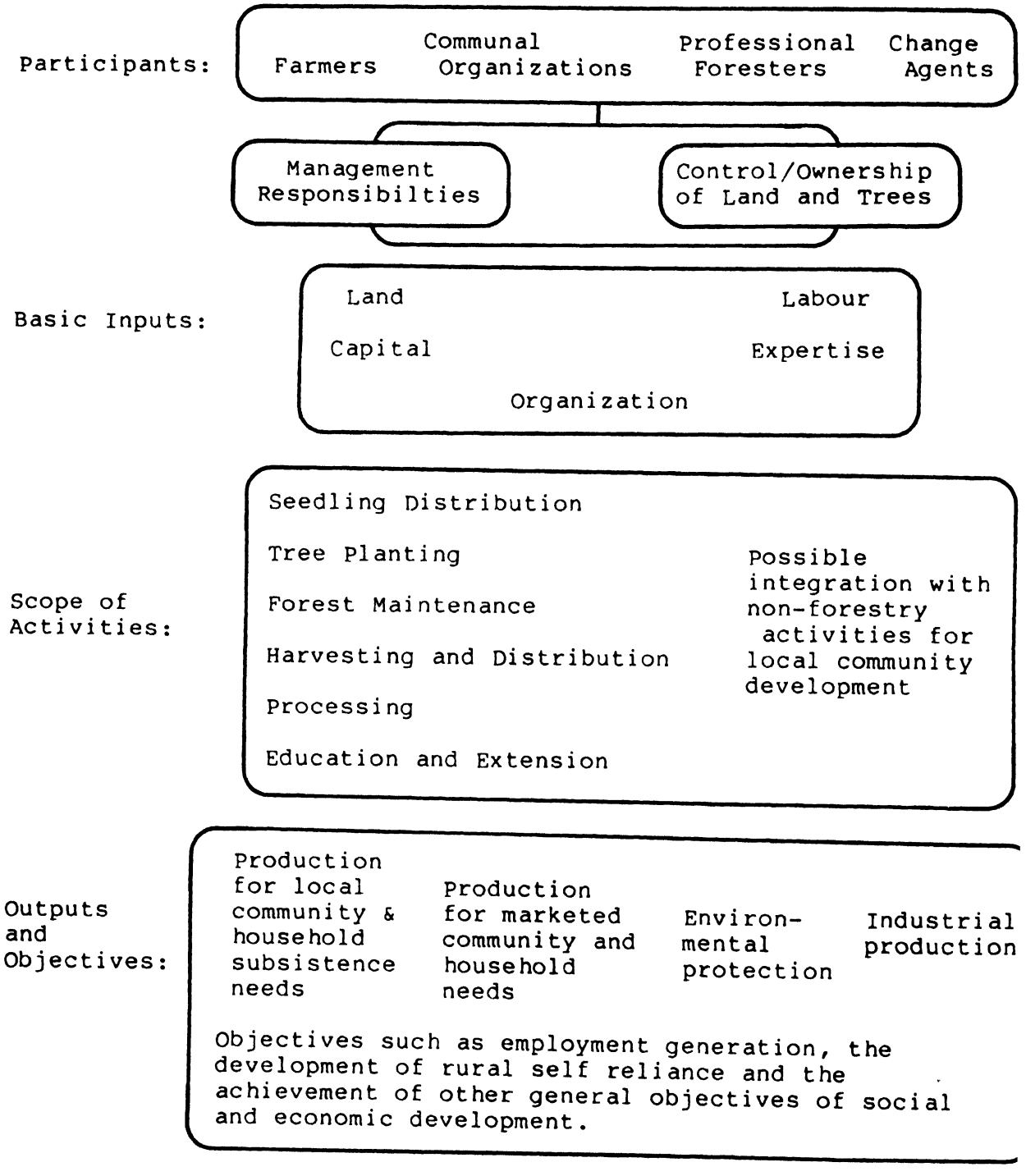
Possible Social Forestry Development Strategies

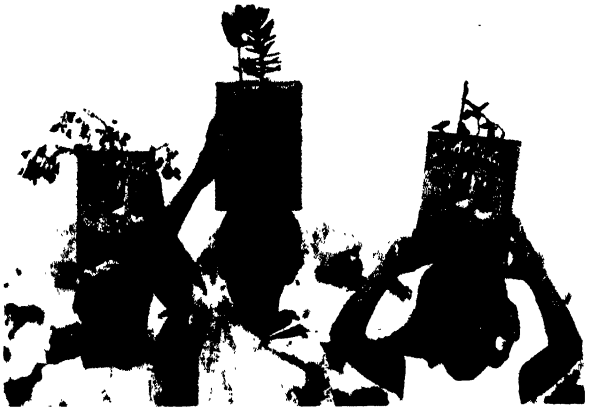
Management of Tree and Land Resources	Control/Ownership of Land: Private	Communal	State
Communal	1.	2.	3.
Private	4.	5.	6.

Social Forestry Management Strategy	Characteristics
Communal and Community-based Forestry	1. Tree growing on private lands organized by community institutions
	2. Communal tree growing on community lands
	3. Public land allocated for communal and community-based forestry projects
Farm Forestry	4. Privately managed tree farming and tree planting around households
	5. Privately-managed tree growing on communal or community lands
	6. Public land allocation schemes for private tree growing

Table 2.2

Developing Social Forestry Strategies





Proud of the school nursery's plants

Communal forestry refers to progammes in which rural communities, or user groups, cooperatively participate in project planning and implementation. This category also includes projects based on the activities of community organizations such as schools or cooperatives which may establish nurseries or plant trees in small or fragmented private woodlots. Communal forestry may involve projects on community lands, on land which has been allocated by the state for the purpose of tree growing or on private land being managed collectively.

Farm forestry for household use

Farm forestry for household use covers programmes which promote tree growing by individual farmers for their own family use. In some cases, these programmes may have the objective of increasing the supplies of fuelwood, building poles, animal fodder or other tree products; in others, the aims may be primarily environmental with trees being planted to control erosion or to increase soil fertility.

Teak for the market

Farm forestry for the market refers to programmes in which the primary aim is to encourage farmers to grow trees as a cash crop. In the majority of cases, the trees are grown on private lands, but public or common lands may be used where usufruct rights have been allocated to farmers.

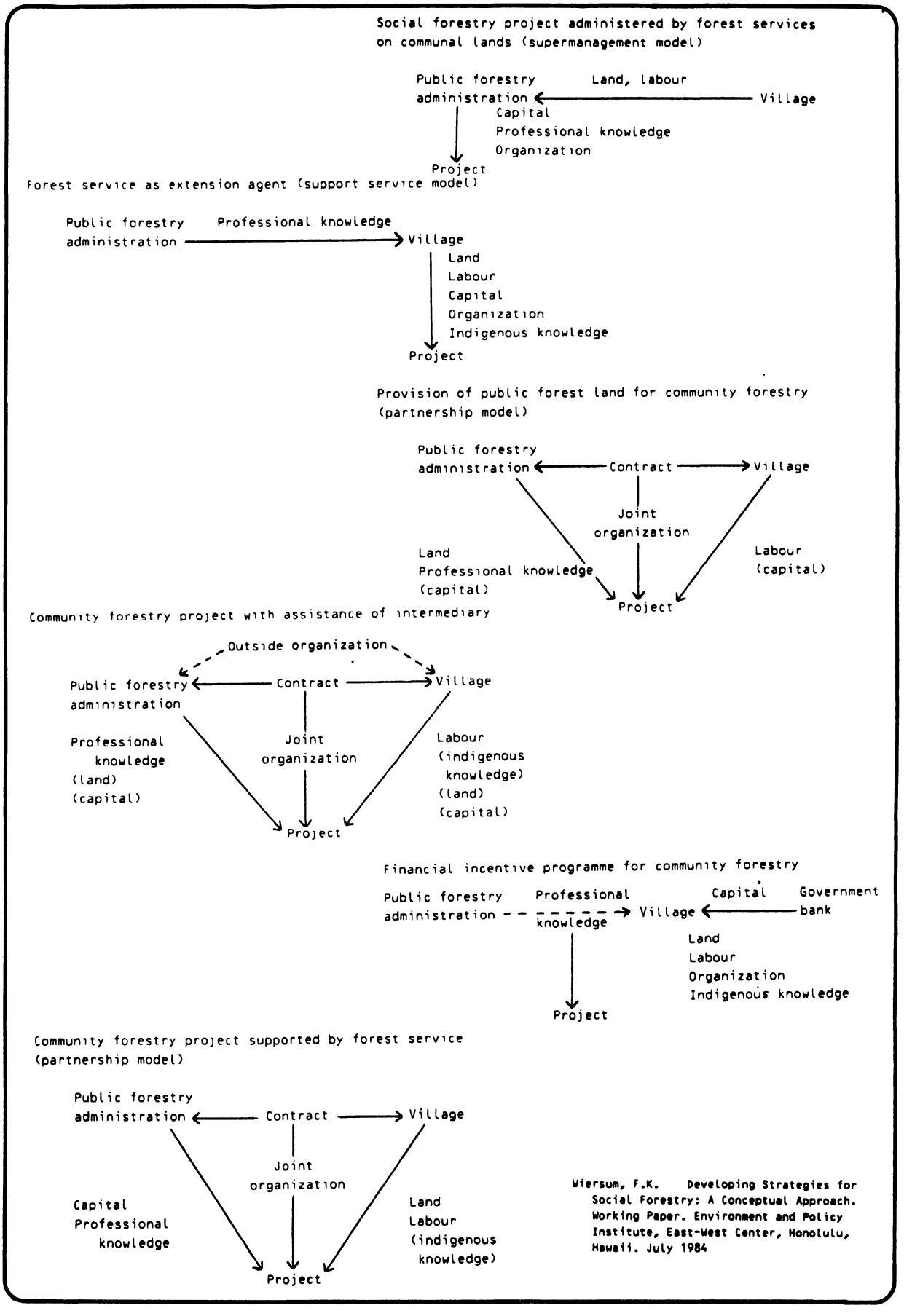
But whatever the distinctions between approaches, the unifying factor in all programmes is that they actively involve rural people and are responsive to their ideas, needs and aspirations. It is this, more than anything else, which should distinguish community forestry approaches from conventional forestry activities.

To the extent that goals encouraging rural participation and management are successful, the forestry service will find itself able to focus on its role as a technical and supportive service rather than as an executing agency. Different services may be needed in the various strategies selected, depending upon the local constraints to tree planting.

For example, for communal strategies, making available state land for communal planting and developing mechanisms to assure participants the benefits of their labour may be necessary. For household farm forestry, careful development of technical options which fit into the farm production system may be the needed focus. Developing market information or credit facilities may be required for market focused forestry.

In some cases foresters are able to put rural residents in touch with existing services or organizations which can provide needed services; in other cases such supports may have to be created. But in all cases foresters must be constantly open to local needs and be willing to locate or develop technical and policy responses to support local efforts in tree planting.

Figure 4 Some Organizational Models for Social Forestry Projects



Wiersum, F.K. Developing Strategies for Social Forestry: A Conceptual Approach. Working Paper. Environment and Policy Institute, East-West Center, Honolulu, Hawaii. July 1984

Chapter 5

Communal forestry strategies

The theoretical attractions of communal programmes are considerable. In principle, they provide a means by which landless people can take part in tree growing and thereby obtain benefits which are otherwise reserved for landowners. Some programmes are designed so that benefits are deliberately channelled toward the poor.

Communal programmes are also one of the few practical approaches to tackling the problem of the degradation of common lands that occurs as a result of the competing demands of local people. Establishing a degree of mutual cooperation may make it possible to organize concerted action to protect these lands, increase their productivity and halt their gradual decline into barren wastelands.

Perhaps the best known recent communal forestry effort has been the Chipko movement. Originating in the Himalayan region of northern India, it was started because a large group of people with common interests in tree resources saw that, by organizing into a group, they could more effectively influence the political and economic forces which were improperly managing their physical environment. The movement first came to public attention in 1973 when members demonstrated against commercial felling of trees in forests where they lived. It has now expanded to cover a number of environmental issues and forestry activities, including plantations (Agarwal and Anand, 1982).

Some other communal forestry programmes have also been actively initiated by local groups or rely on a high level of community participation and control, usually where there are already strong local institutions or traditions of collective local management of natural resources. They are generally designed to use land which is under direct community ownership or state lands which have been specially designated for community control. The main responsibility for planting and looking after the trees is taken by the community or a communal group and the role of the promoting agency is primarily catalytic or technically supportive.

In contrast, the forest department at times has taken on the primary responsibility for carrying out the planting. Inputs such as fertilizers and seedlings are provided without any outlay by the community. The engagement of the local community in the implementation of schemes of this type is largely passive and is normally restricted to providing hired labour for planting, and an agreement to cooperate in protecting the plantation. Although some of these more forest service controlled projects have been established in the hope of turning management progressively over to the community, to date this has seldom been effected.

The majority of communal forestry activities lie somewhere between these two strategies. Most recent programmes involve some form of continuing participation of both the local community and the original implementing agency. Often this is done in order to try to overcome some of the weaknesses associated with either entirely "self-help" or entirely "departmental" management systems. Within this broad framework, a wide variety of different experiences has emerged.

5.1 Examples of Communal Tree Growing Activities

5.1.1 Strengthening Traditional Communal Forestry Systems in Nepal

The management of common property forests around rural villages has long been practised among some communities and villages in the hills of Nepal. Traditional control systems usually involved protecting certain highly valued forest types for specific products such as leaf litter from oak forests, tree fodder from chestnut or Shorea robusta forests, or fuelwood branch loppings from Shiima walichana forests. Each member of the user group contributed to the in-kind wages of forest guards and collected the produce according to the agreed rules.

In 1957, however, the government nationalized all forests, intending to introduce more intensive forest management. At the same time, land survey legislation was introduced which defined adjacent lands which were left fallow for at least two years as forest lands. In some cases, forests which were thus no longer under communal jurisdiction rapidly deteriorated, and the government was unable to establish any real level of formal control (Molnar, 1981).

In 1978, the government enacted progressive new legislation which began the process of reversing nationalization by gradually transferring control of the forests back to local populations. In contrast to earlier traditional communal systems, local management was to be based at the lowest level of local government, the panchayat. The government established a series of management rules and guidelines which were intended to assist the panchayats in controlling forested lands. In order to provide the necessary supporting services to bring about these changes, a new Community Forestry and Afforestation Division was formed within the Forestry Department.

Two new forms of land management were introduced which clarified the legal relationship which could be established between the panchayats and the forests: the Panchayat Forest (PF), and the Panchayat Protected Forest (PPF).

Panchayat Forests are new plantations, as large as 125 hectares, which have been established on government wastelands, but which are planted and protected at the request and with the participation of the local panchayat. The panchayat has all rights to the produce of these forests.

Table 3

Control Systems Used in Traditional Forest Mangement

Basis of Group Rules	Examples
1. Harvesting only Selected	Trees: timber, fuelwood, food (fruit, nuts, seeds, honey), leaf fodder, fibre, leaf mulch, other minor forest products (gums, resins, dyes, liquor, plate leaves, etc.) Grass: fodder, thatching, rope Other Wild Plants: medicinal herbs, food (tubers, etc.), bamboos, etc. Other Cultivated Plants: upland crops (maize, millet, wheat, potatoes, vegetables), fruit, etc. Wildlife: animals, birds, bees, other insects, etc.
2. Harvesting According to Condition of Product	Stage of growth, maturity, alive or dead Size, shape Plant density, spacing Season (flowering, leaves fallen, etc.) Part: branch, stem, shoot, flower
3. Limiting Amount of Product	By Time: by season, by days, by year, by several years By Quantity: no. of trees, head-loads, baskets, no. of animals By Tool: sickles, saws, axes By Area: zoning, blocks, types of terrrain, altitude By Payment: cask, kind, food or liquor to watchers or village, manure By Agency: women, children, hired labour, contractor, type of animal
Using Social Means for Protecting Area	By Watcher: paid in grains or cash By Rotational Guard Duty By Voluntary Group Action By Making Use of Herders Mandatory

Source: Arnold, J.E.M. and Campbell, J.C. Collective Management of Hill Forests in Nepal: The Community Forestry Development Project. National Academy of Sciences. 1985

Panchayat Protected Forests are areas of natural forest, up to 500 hectares in size, which usually need upgrading through planting, as well as subsequent protection and management. Panchayats which undertake these activities are allowed to keep 75 percent of the revenue generated by the forests. Under this programme, around 1.5 million hectares (45 percent of the forested lands in the hill areas) are eligible for transferral to panchayats that request it. Since the Community Forestry Development Project was initiated in 1980, some 8 000 hectares of PPFs have been established, and 7 300 ha have been planted in PPFs and in PFs, involving over a third of Nepal's 79 districts.

A forest managed by the local community

It is probably too early to speculate about the longer term impacts of this programme. However, it is interesting that in many cases the panchayat has been found to be too large an organizational and management unit. This is in part because it often cover a large area of difficult terrain which lacks basic communication and transportation facilities. Panchayats are also usually composed of separate villages made up of heterogenous groups, making common lands management somewhat problematic.

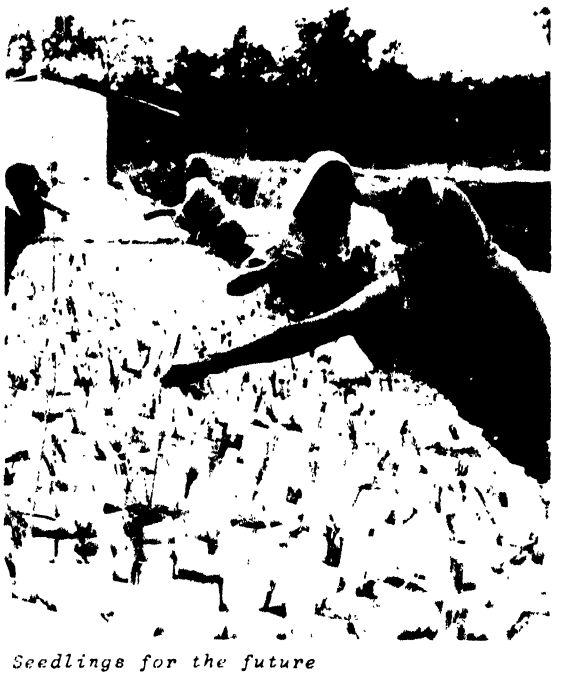
However, in many cases groups of wood users within the panchayat have developed their own forest management strategies. Such user groups have been found in 36 percent of the panchayats participating in the programme. These management units, at the level of the village or ward, seem to have a greater homogeneity of interests than the panchayat (Campbell and Bhattarai, 1983).

5.1.2 Introducing Tree Growing into Common Land Management in India

In India, the existence of common grazing lands is widespread. A main thrust of programmes to encourage communal tree growing in many parts of the country has been to encourage use of part of such existing degraded common land for local woodlots.

Attempts to engage communities in tree planting date back to the 1940s, although these early efforts were slow to show results. In the 1960s, the states of Tamil Nadu and Gujarat introduced programmes of tree planting on the foreshores of community irrigation reservoirs and along roadsides, canals and railway embankments. These programmes were intended to create local employment opportunities, and to produce fuelwood and building timber for sale. Their management largely remained the responsibility of the Forest Department which bore total project costs. Sales of timber and fuelwood helped to offset costs.

At first, local cooperation remained largely passive. However, the fact that the trees survived and produced income for the Forest Department had an important demonstration effect. Spurred by an extensive publicity campaign and provision of seedlings, local villages gradually showed more interest in becoming directly involved with the programme (Sundaram, 1978). In the 1970s, management responsibilities were increasingly shared with local communities, and arrangements were made to split net profits between the Forest Department and the communities on a 50:50 basis. Under these arrangements, 176 000 ha. of plantations were established in Tamil Nadu and 29 500 hectares were established in Gujarat.



Seedlings for the future

While these earlier efforts mostly involved planting trees on state-owned land (although resource management decisions about these lands were usually made by farmers), subsequent efforts also involved the use of communal lands. In Gujarat, for instance, the Forest Department asked local village panchayats to allow it to establish plantations of at least 4 hectares in size on village lands to be planted with various fuelwood, fodder and fruit trees. In return, villagers were to be allowed access to these lands for fruit and fodder collection and were promised a 50 percent share of net profits when the trees were cut. To date, in sample villages, residents have mainly been allowed to purchase fodder grass from under the trees from the panchayats, which retain the money for communal activities. Community participation in these cases involves providing the land, cooperating in woodlot protection and helping to determine species mix. Once the woodlot is fully established, which takes from 3 to 6 years, the panchayat is supposed to assume complete responsibility for management and protection.

The initial response to these "Supervised Woodlots" was slow. Villagers were concerned that the government would permanently appropriate communal lands which had been given over for planting. Confidence in the Forest Department, however, has gradually improved and by the end of the 1984 planting season over 40 000 hectares of woodlots had been established in 7 000 of Gujarat's 18 000 villages (Shukla and Dalvi, 1984). However, few of the panchayats have shown interest in taking over management functions for these woodlots, and some evaluations have indicated that many local people believe these plantations belong to the government and so doubt that they will receive benefits.

In a separate attempt to increase community involvement further, a parallel scheme was introduced in Gujarat in 1980 in which villages are encouraged to establish and manage their own

community plantations. The Forest Department agrees to provide seedlings and technical assistance, but villages are expected to provide all the other necessary inputs. After harvesting, the community will receive all the proceeds from these "Self-Help Woodlots". It has been difficult to encourage community involvement in these schemes, and early progress reports were rather disappointing. However, there have been recent indications that communities have become increasingly involved (Shukla and Dalvi, 1984).

Critics have noted that the attempt at incremental involvement of residents in these schemes has made the people suspicious of the changing rules. These observers have suggested that clearly defined options and procedures at the beginning of an activity are more apt to leave the residents confident that they understand the rights as well as the obligations of participation, and that they will truly receive promised benefits.

Strong market demands for wood products has in some areas increased the interest in establishing community woodlots. Producing wood for the market can be an effective way of generating community funds. In Tamil Nadu, for instance, an Acacia nilotica woodlot planted around an irrigation tank reportedly can yield around $500 per hectare after 10 years; a 50 ha plantation can produce $25 000. Even after deducting planting costs and splitting the profits with the Forest Department, this is still a sizeable input into a community's budget. In this project, panchayats have complete control over their profits, and many express interest in using these future earnings on public works projects such as schools, health facilities and water supplies.

The Indian experience suggests that demonstration activities may be necessary before communities will be interested in participating in communal forestry; it was only after the viability of tree growing had been demonstrated on state lands that community lands were used for plantations. Because of the market opportunities, it is possible that the benefits of community woodlots were perhaps more obvious than they might be in places where tree resources remain free goods.

5.1.3 Community Choices between Land Uses in the Sahel

Over the past decade or so, a tremendous effort has been expended in the Sahel to promote community forestry, in large part as a response to the devastating effects of the Sahelian drought. It has been estimated that at least $160 million were spent on forestry projects in the Sahel between 1972 and 1982.

Drought effects - often worsened by land use

The results have generally been disappointing. Perhaps 25,000 hectares of village woodlots have been planted; many of them grow so poorly that they produce little, if any, wood (Weber, 1982). In Senegal, for instance, one project succeeded in establishing several hundred hectares of village woodlots, but productivity was found to be less than that of the natural forests they had replaced.

Where village woodlots in the Sahel have actually grown and been productive, it has tended to be because they have been planted and managed by the Forest Department, virtually excluding the involvement of local people. In effect, a series of public works emergency programmes was launched with the aim of preventing desertification and of providing fuelwood.

The failure to attract local participation was due largely to poverty, to drought and to the mistaken belief that woodlots were a desirable alternative to existing land-use practices. To villagers, the displacement of common lands was an extremely risky proposition and was especially disruptive of their customary land-use practices (Thomson, 1983).

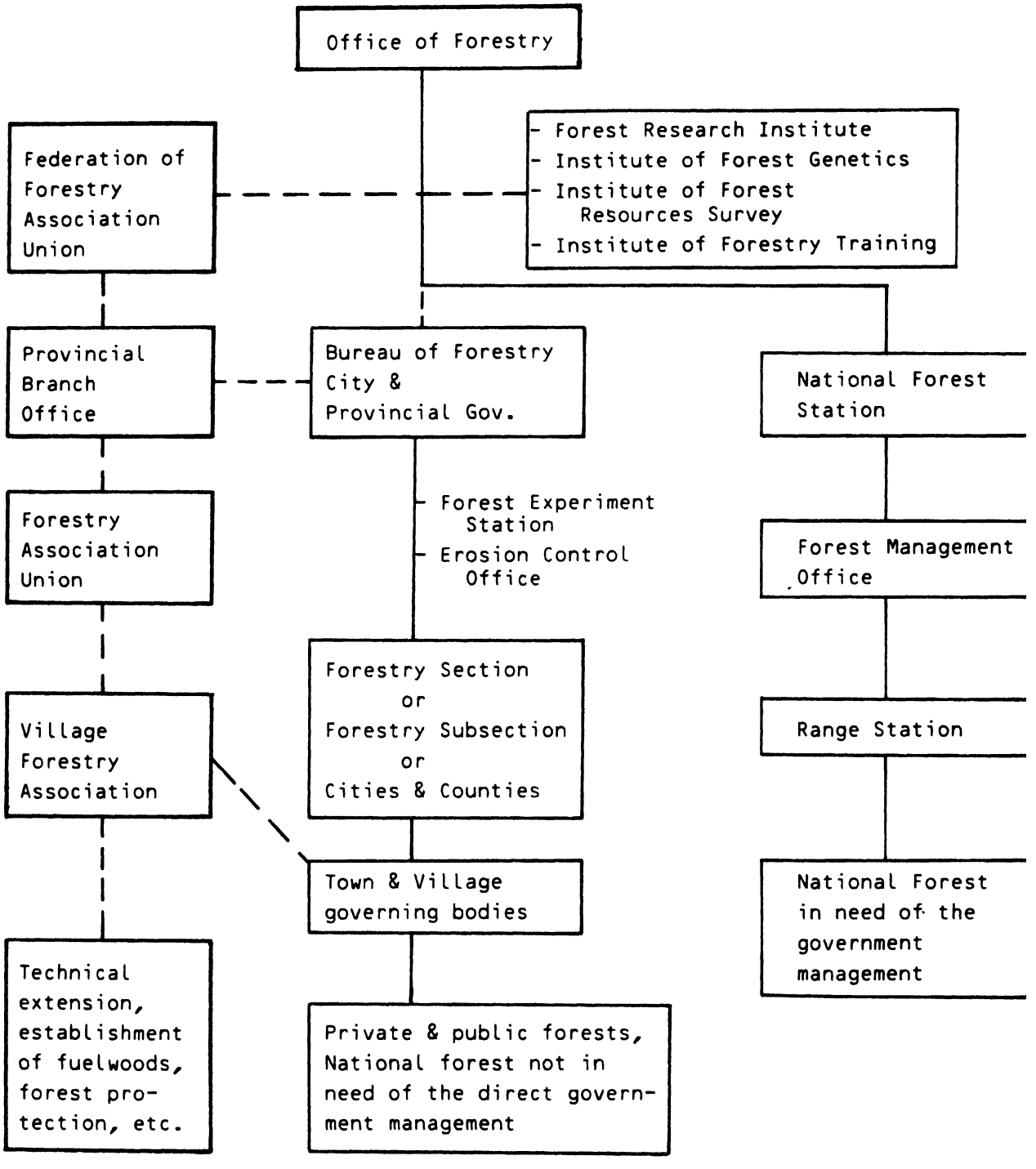
Many of the projects focused solely on wood production and neglected local needs for a host of non-wood products such as human foods, animal forage, medicinal products and other traditional forest products. Block plantations are also often alien to and incompatible with local patterns of land-use (Taylor and Soumare, 1984). Local people lost access to common grazing lands, and the costs of this loss were found to be quite substantial. Sometimes the loss of these benefits provoked open resentment among the communities these efforts were intended to help. There is the often-cited case of a village woodlot effort in Niger where rural people destroyed tree seedlings which the forestry department had planted on common grazing lands without seeking local villagers' agreement.

Recently, new approaches have been initiated. In Burkina Faso, for instance, a special unit for village woodlot programmes has been created. This unit is intended to provide farmers with the technical resources to better manage natural vegetation, as well as planted trees, for their own use. Where the passive management of natural regeneration is no longer sustainable, alternative local agroforestry systems are being adapted and made more efficient. Although it is too early to judge the longer term impacts of this programme, early results have been encouraging. After the first four years, 860 villages have collectively planted around 1 200 hectares, and another 1 500 hectares have been planted by farmers, with survival rates of around 70 percent (Compaore et al., 1984).

5.1.4 Tree Growing by Village Cooperatives in Korea

There has been a long tradition of forestry cooperatives in the Republic of Korea, where nearly three-quarters of forest lands are privately owned. However, as a result of wartime destruction and growing demands for fuelwood and timber, by the 1960s the forests were severely depleted, and environmental damage to agricultural lands due to excessive deforestation was mounting.

Figure 5 Relation of National and Private Forestry Organizations in the Republic of Korea


Office of Forestry
Federation of Forestry Association Union
- Forest Research Institute
- Institute of Forest Genetics
- Institute of Forest Resources Survey
- Institute of Forestry Training
Provincial Branch Office
Bureau of Forestry City & Provincial Gov.
National Forest Station
Forestry Association Union
- Forest Experiment Station
- Erosion Control Office
Forest Management Office
Forestry Section or Forestry Subsection or Cities & Counties
Village Forestry Association
Range Station
Town & Village governing bodies
National Forest in need of the government management
Technical extension, establishment of fuelwoods, forest protection, etc.
Private & public forests, National forest not in need of the direct government management

Source: Gregersen, 1982

Table 4 Korea: Expenditure on village afforestation

Class. Year	Amount of work[a]	Total Expenditure	Government Expenditure		Villager's expense
			Central	Provincial	
	(1,000 ha)		(1,000 Won)		
Total	1,000	143,491	76,502	13,805	53,184
	84.2[a]	90,307			
	920[b]	53,184			
'73	3.5	4,183	3,453	730	2,776
'74	9.2	7,183	5.892	1,291	2,770
'75	11.0	8,767	7,434	1,333	3,884
'76	8.2	10,480	8,987	1,493	5,079
'77-'82	52.3	59,694	50,736	8,958	38,675

Source: Gregersen, 1982

[a] Reforestation
[b] Erosion control

Table 5: Korea: Income generating by-products from village forests

Unit: Amount: M/T
Price: Won

Product		Year							
		1971	1972	1973	1974	1975	1976	1977	1978
Oak mushroom	Amount	208	263	240	337	456	496	678	776
	Price/kg					3,250	3,360	6,250	7,350
Pine mushroom	Amount	65	170	215	137	441	228	327	983
	Price/kg					4,100	7,853	11,502	16,425
Kuzu fibre	Amount	274	204	341	312	398	341	658	329
	Price/kg					1,693	1,858	2,198	2,449
Corkoak bark	Amount	768	772	782	921	815	616	715	788
	Price/mt.					39,823	48,672	61,563	76,691
Resins	Amount	689	459	1	376	866	993	290	206
	Price/mt.					19,646	24,486	29,327	34,814
Chestnut	Amount	2,789	2,905	2,949	3,449	7,697	16,789	20,594	29,494
	Price/kg					372	420	480	713

Source: Gregersen, 1982

Working for the village forestry association

Important legislative changes in 1972 gave the government the power to require landowners to reforest private lands. Owners who could not afford to plant their land entered into profit-sharing contracts with local Village Forestry Associations (VFAs) which had been given primary forest development responsibilities within the framework of Saemaul Undong, a broad-based national movement to encourage self-help community development activities. The VFAs were locally elected organizations, voluntarily managed by villagers and operated like cooperatives. There is no question that local participation was at first the result of firm, authoritarian government pressure. Nonetheless, the VFAs provided an exceptionally strong base of local support which helped make village forestry a popular movement.

Although VFAs are ultimately subject to the guidance of the government, villagers perceive them as being local institutions run by the community. Over 21 000 VFAs belong to county-level Forestry Association Unions (FAUs). VFAs and FAUs both belong to the National Federation of Forestry Association Unions (NFFAU) which has loose administrative links with the government's Office of Forestry, part of the Ministry for Home Affairs. This arrangement allows a great deal of local independence, while encouraging close working relationships with the government, which bears about 65 percent of the costs of the programme. This level of local autonomy has been essential for community involvement because over the years villagers had grown to associate the Office of Forestry with the policing functions related to its role of protecting forests.

Between 1973 and 1978, the VFAs reforested more than a million hectares with a mixture of fuelwood, fruit, short rotation and timber species. Income from mushrooms, wallpaper fibre and other products, which they had been encouraged to introduce along with the woodlots, grew rapidly. The National Federation of Forestry Association Unions handled the marketing and the government provided low cost credit, as well as research and extension services.

Though many of the circumstances of this programme are clearly particular to Korea, a number of the underlying principles and approaches used could have wide relevance: the broad-based approach toward rural development, the blending of top-down and bottom-up planning, the emphasis on short-term gains in income and welfare, public support for the rapid development of markets for wood and other forest products such as mushrooms, the provision of adequate technical assistance and extension, a conducive legislative environment, and timely access to financial subsidies and loans (Gregersen, 1982).

5.2 Constraining Issues within Communal Forestry

In spite of theoretical advantages, collective forestry has had a mixed record to date. In many countries, progress has been slow, and many constraints have been encountered. Most of these limitations have not been related to the question of the diffusion of new and innovative rural forestry technologies; rather, they seem to be a question of how and why people cooperate.

Possibly the most serious constraint to communal forestry results from social, economic and political heterogeneity in rural communities (Noronha, 1983, 1982; Hoskins, 1982a & b). Communal forestry has been most successful where socio-economic homogeneity has been greatest, for instance in Korea. In many countries, however, communities are made up of cultural mosaics of different social and economic groups, segmented by caste or tribal affiliation and by wide differences in income. Consequently, there are almost always conflicting needs within local villages: between farmers and pastoralists, between the landless and landholders, between women and men, etc. A collective orientation toward tree resources may be lacking, and existing institutions may be unable to develop an effective means of common resource management. A mid-term review of the "Self-Help Woodlot" programmes in Gujarat, for example, suggested that these activities were difficult to initiate primarily because of non-homogeneity within communities and because of a popular mistrust of systems which were intended to ensure the equitable distribution of woodlot income.

5.2.1 Land and Tree Control Issues

Land use conflicts have proven to be one of the most serious obstacles to the effective implementation of communal forestry projects. They are often an expression of basic heterogeneity and conflict of interests among villagers. Common lands are seldom "unutilized", and by planting trees on them, some land-use practice is likely to be affected, possibly leaving some members of the community worse off than before. In many cases, the loss of grazing lands to community forests has particularly affected poorer members of the community. The lesson of experience is very clear: however it is achieved, early resolution of any potential conflicts in interests over access to land is absolutely crucial to the success of communal forestry programmes.

Members of a community may have conflicting customary and accepted uses for that land. Uses may change by seasons or activity. Certain families may have rights to collecting, others to herding or crossing, others to farming on the same land at different times. Informal and illicit private uses of common and public lands may have an important economic value, and this will have to be taken into account if alternative activities are planned. The *de jure* and *de facto* situations with regard to control of the land may be greatly different, but even where they are more closely congruent, there simply may not be enough common land available to meet different needs. In Uttar Pradesh, India, for instance, there is a widespread policy of distributing

village-managed common lands to the landless. Consequently, the pressures on remaining village-managed lands are greatly increased, and land may not be available to set aside for community woodlots (Noronha, 1980).

In contrast, there are cases where nominally public land is, in fact, under the control of private individuals. In a community forestry project in Azad Kashmir, Pakistan, plantings were originally to be undertaken on government lands and were later to be extended to common "shamlat" lands. Mid-way through the project, however, it was discovered that shamlat lands, for the most part, were actually privately controlled by wealthier farmers. These same farmers were eager to take advantage of project subsidies for planting, hoping to get their lands planted at full government expense and guarded from others (Cernea, 1981). The programme has since been altered in order to bring it into line with its original objectives.

In many traditional tenurial systems, there is often a distinction between land tenure and tree tenure. Planting trees, even on communal lands, may have a significant impact on land control. For instance, even if land is communally owned, people who plant trees on the land may be establishing certain property rights, either to the trees or to the land. In some cases, planting trees on communal lands by the forest department has been understood to mean that these lands were being taken by the government. In both of these instances, the intention that the benfits from a community forest should be shared with equity is jeopardized.

5.2.2 Distribution of Benefits

A closely related issue is how benefits of communal forestry activities are distributed. This may often be a function of how use-rights to trees growing on common lands are established. Residents of a certain village may be granted use-rights, while "strangers" may be denied access to trees. In a Nigerian court case in 1926, for instance, the principle that only "local people of the neighbourhood" could harvest palm trees was upheld.

For the most part, however, the question is really one of how the benefits from a community forest can be equitably distributed among community members. Within a community, access to trees which grow naturally on common and public lands is not always clearcut and may be a function of status within a village, income group, physical proximity to common lands, household size and so on. Tree tenure rights which define the right to use trees which have been planted on common property can be established by similar criteria. These, however, may be inconsistent with project objectives which emphasize equal sharing of an activity's costs and benefits.

Questions about how benefits are to be shared have posed serious problems in many communal forestry projects because there has been no clear and agreed upon method for splitting the output. Participants are often unsure if returns will go to the forest department, to a common village fund, to specific village

groups or projects, or if they will be directly shared among villagers. Whether or not the question of the distribution of a project's costs and benefits will be resolved depends very much on the confidence village people have in their local leadership and the degree to which arrangements have been publicly agreed and recorded. Many rural people are intensely suspicious of financial dealings undertaken on their behalf by others.

Particular limitations of commercially oriented programmes also need to be borne in mind. Almost all Indian programmes have been implemented where there is a strong commercial demand for wood products. These activities can be an effective means for generating community funds for building schools, developing better water supplies, constructing health facilities or providing other local benefits.

However useful such commercial arrangements may be to the community at large, they may have little positive impact on increasing the availability of tree products for people in the lowest economic levels. Increased fuelwood supplies may lower the price of fuelwood in the marketplace; but because many poor rural people are unable to afford fuelwood at any price, they will have to continue to use what other traditional sources of fuel, such as agricultural residues and animal dung, they can find.

In community schemes where a clear and locally acceptable method of benefit-sharing has not been agreed upon, the development of future difficulties when the trees are harvested is quite possible. This is causing concern in a number of countries where communal plantations, established in the late 1970s, are beginning to reach a harvestable age. The continuation of many projects beyond the first harvest will depend greatly on the extent to which the problem of benefit distribution is resolved.

One approach to ensuring that all members of a community or user group benefit from community forests is to guarantee that the benefits are split equally. This approach is, in fact, adopted by many panchayats in Nepal and India.

5.2.3 Institutional and Management Issues

The task of supporting communal forestry is often equated with that of strengthening local institutions. However, existing community institutions often perpetuate existing differences and inequalities, as they tend to represent and maintain the local pattern of power and interest. This is especially true in communities with a great disparity in income distribution. Wealthier members of a community usually have the loudest voice in decision-making. They are able to mobilize support among people who depend on them for such things as employment, tenancy and loans. Consequently, their viewpoint may prevail over the interests of the community as a whole.

It is optimistic to suggest that the powerful members of the community will be likely to represent the views of the poor. They frequently oppose and frustrate measures which aim to bring

about change and social reform. This may be true also of local agents of the forestry and other government services. It cannot be assumed, therefore, that by giving local institutions the authority to carry out community forestry activities, they will automatically further the cause of the most deprived in the community. It is unrealistic to expect village-level community forestry activities to be more progressive than the rest of society.

Local institution strengthening or building is a lengthy and complex business and must take into account the real distribution of social, economic and political power at the local level. Expectations, again, must be realistic. Often much depends on central institutions, such as forestry departments, promoting collaboration, providing project management and arriving at an equitable means of distributing a project's benefits. This is especially true if a community is expected to risk capital and labour resources for tree growing. Possible approaches include developing demonstration projects on public lands, as well as promoting community forestry through farm forestry activities.

A public discussion

The level of trust within a community, and between communities and the government, is frequently related to the process by which agreements between them are established. The greater the degree of public discussion at the beginning of a project about how the benefits from communal forests are to be distributed, and the extent to which this discussion leads to a concensus, the greater will be the level of trust between rural people and community leaders.

Perhaps the most concrete management concept to emerge from communal forestry experience to date is that successful management groups need not be geographically defined by village or panchayat, but rather by user groups with a shared interest in managing the particular resource. However, the interests of all parties affected by the activity must be considered. In cases where residents organize around felt forestry or environmental needs, technical support can be especially effective.

Some local institutional constraints may require public legislation before communal forestry programmes (as well as other approaches toward community forestry) can be implemented. The establishment of alternative systems of land tenure, as in Nepal, can be an effective legal method for favouring community involvement. Sometimes, legislation must be more authoritarian, as in Korea, but this approach will not always be realistic, given the variety of individual and cultural responses to expressions of authority and the difficulties faced in enforcing legislation.

In some instances, as in the Integrated Project for the Conservation and Community Reforestation of Deteriorated Watersheds (PRIDECU) in Colombia, it has been possible to overcome constraints relating to availability of land for communal use by allocating public land. Where forest settlement has placed heavy pressures on watersheds, illegal settlers are encouraged to form cooperative societies which can legally apply for title to these public lands. In accepting title to degraded areas, newly-formed cooperatives enter into a land-use management agreement with the National Institute of Renewable Natural Resources and the Environment (INDERENA).

Other institutional constraints can also limit the success of community forestry approaches: poor seedling distribution systems, poor management, lack of village funds in order to pay for labour, lack of labour at the right time, planting ill-suited exotics vis-à-vis other options for natural stand management and so on.

Providing protection to communal woodlots is a particularly frequent problem which may sometimes be reduced by staggering tree planting over several years so the area which must be protected at any time is kept as small as possible. When the trees have reached a stage where they will be safe from livestock damage, the area can be opened for grazing and browsing. People might also be given access to protected areas for fodder collection, and it is quite likely that fodder production will be greater on these lands if they are protected from free grazing.

The type of silvicultural management system which is adopted is also important. For example, if the community's on-going needs are to be met, annual cutting cycles may be required. However, if the woodlot is very small and the size of the community large, it may not be feasible to divide a small harvest on an annual basis. Similarly, if local people are to be involved in the harvesting, socially workable schemes such as clear-cutting may be preferable to more technically difficult systems like selective thinning. Any management system must, of course, be within the technical competence of the user group and be simple enough that members will feel confident that they can control it in practice.

5.3 The Scope for Communal Forestry

Communal forestry activities have seldom managed to meet the expectations which have been placed upon them. The problem has not been so much that these approaches are intrinsically unmanageable; rather, they have been burdened with rhetoric and over-ambitious objectives. Achievable reality and expectations have often been separated by a wide gap. Also, communal management, land and benefit distribution issues have proven to be much more complex in communal forestry activities than proponents had expected. The result has been a certain sense of disillusionment.

Nevertheless, experience has shown that in the appropriate circumstances, and with effective support from governments, forestry services and local organizations, very substantial

community tree planting achievements can be made. Events in Korea and India have demonstrated this on an extremely large scale.

The practical limitations of programmes, particularly in their capacity to bring about significant social change, must, however, be accepted. It is true that communal forestry programmes can provide an effective means of helping the poorer members of the community, but this depends almost entirely upon the commitment of the local community organization to doing so.

If the plantation is treated as a purely commercial enterprise and the wood is sold to dealers from urban areas, the result will be similar to a farm forestry programme. There will be a net increase in the total biomass production in the area, but the available fodder and fuelwood to the poor may well be reduced.

The point is not that communal forestry projects necessarily harm the poor; it is that they do not automatically benefit them. If resolving the problems of the poorest members of the community is taken as a major objective of a programme, its design and implementation will have to be explicitly tailored so that this objective is reached. Simply ensuring that trees are grown or that power is devolved to local community organizations will not in themselves necessarily bring any worthwhile benefits to the poor.

It is important that the unsatisfactory record of some of these programmes not be allowed to obscure the substantial achievements that have been made in other cases and the great potential of this approach. Communal programmes will always require painstaking preparation. They may not be able to produce the spectacular production results of the farm forestry programmes with which they are often compared. However, almost all of the different types of programmes which have been developed to date offer opportunities for effective and relevant action under the appropriate conditions.

Chapter 6

Farm forestry for household use

Cultivating of trees on and around smallholdings can achieve a number of purposes for the farm family. It can provide direct access to products needed for household use such as fuelwood, construction materials, fruit and other arboreal foods. It can provide inputs into the farm system such as animal fodder and green mulch. It can help decrease the rural smallholder's exposure to environmental risk by increasing protection against soil erosion and degradation. And it can increase the stability of the farm system by adding to the diversity and seasonal spread of farm products.

Fodder - a farm forestry product

Programmes to encourage farm forestry for household use are, therefore, usually the most direct way to help farmers strengthen or create the kinds of tree management systems described in Chapters 1 and 2. As these are low intensity forestry strategies which bring little direct financial gain (though other benefits and indirect gains may be substantial), production will rarely achieve the same dramatic results as farm forestry programmes which take advantage of significant market incentives. Tree management will not involve the use of high labour and capital inputs. Often, cultivation of trees as part of a farming system will be intricately linked with other agricultural activities.

Tree management will be more active where there is the prospect of indirect financial gain, for instance because of increases in crop or animal production through the effective use of agroforestry systems. Although the focus here is on production for subsistence and household uses, there is no clear dividing line between these types of activities and more market-oriented farm forestry activities; any surpluses are apt to be marketed where that is an option.

6.1 Fuelwood and Other Single Product Programmes

Many of the recent programmes to involve smallholders in tree growing have had the objective of increasing household supplies of fuelwood. Most have attempted to achieve this with on-farm production systems designed around this single output. Experience suggests that such narrowly focused approaches to farm forestry need to be reevaluated.

In Malawi, for example, the Wood Energy Programme was designed to increase the rural availability of fuelwood by

providing seedlings of fast growing, high yielding species to farmers in wood-scarce areas. Few farmers were found to be interested in the programme, and only 10 percent of the targeted plantings were realized. Surveys suggested that this was in part because there was only a limited perception of scarcity: as long as fuelwood could still be collected without paying for it, farmers had little incentive to plant fuelwood-producing trees. On the other hand, people were quite interested in growing trees for construction poles (with fuelwood being produced as a by-product), and many were already engaged in tree cultivation for this and other purposes by transplanting and managing naturally germinated seedlings (Energy Studies Unit, 1981).

Other experiences have suggested that, even where it is recognized that fuelwood is in short supply, local people are rarely motivated to grow trees only for fuel -- except perhaps where there are markets for it. In Nepal, rural people's overriding concern is for multipurpose fruit trees and for tree fodder for their buffalo, and not for trees to produce fuelwood (Campbell and Bhattarai, 1982). In drought-stricken areas of Senegal, it has been found that people are interested in planting trees for fodder, shade, fruit, gum arabic and construction materials, but not for fuelwood, especially where fuelwood is still available from trees killed by the drought (Hoskins and Guigonis, 1979). In North Yemen, people are much more interested in planting trees for environmental protection rather than for fuelwood (Aulaqi, 1982). Experiences such as these tend to discredit the general belief that fuelwood shortages can be isolated from other problems for the rural poor, and that planting single purpose fuelwood trees is an appropriate response.

People often prefer multipurpose trees

Tree planting, however, is only one of a variety of responses to fuelwood scarcity. Other possible local responses such as increasing the time spent to collect wood, changing cooking habits or using less wood by switching to the use of alternative fuels such as straw and dung, may involve fewer costs and have greater benefits than planting trees specifically for fuelwood. People are interested in

A tree - for fuelwood use only?

growing trees, but for other perhaps more highly valued reasons. It is important to note, however, that people fully expect to get fuel from trees which have been planted for other purposes.

6.2 Multiple Output Programmes

Some of the programmes which have encouraged tree growing to provide multiple outputs have achieved a significant success. This experience reinforces the assessment that farmers widely value trees for a variety of inputs into their household and farm systems, and seek trees which provide as large an aggregate as possible of such benefits. They seek tree growing strategies which fit into their production system with minimum cost.

In Central America, the Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE) has persuaded 90 farmers in the Piedades Norte area of Costa Rica to plant approximately 50 000 trees by encouraging different types of planting strategies, such as live fences, shade trees and windbreaks. A variety of multi-purpose species were made available at local nurseries, and farmers were quick to incorporate trees into their farming systems. In a recent survey, these farmers gave several motives for planting the trees; although they frequently specified a principal reason, they always mentioned alternative or complementary uses as well (Jones and Campos, 1983).

Other less direct benefits such as soil improvement and increased agricultural production can also provide a motive for tree growing. In the 1960s, an Indonesian programme on the island of Timor attempted to reduce soil losses by terracing the steep volcanic slopes of the Sikka region, but this was found to be a very expensive and labour intensive operation. In 1972, a farmers' cooperative introduced hedgerow planting of Leucaena along parallel contours. A local Catholic mission helped to further coordinate the effort, and after ten years over 45 000 hectares of degraded lands had been partially terraced. The primary aim of the project has been soil conservation, but farmers have gained other substantial benefits as well. The hedges also provide green manure for fertilizing the soils and fodder for livestock, as well as fuelwood (Metzner, 1976; Jones, 1983).

Preventing soil erosion has also been a significant component of other programmes. In Nyabisindu, Rwanda, low-input farm forestry has been incorporated into smallholder farming systems threatened by soil erosion. The Projet Agro-pastoral has encouraged the establishment of trees and hedges on degraded smallholdings as part of its effort to improve local agricultural production and livestock development. Around 170 local tree nurseries produce over 5 million seedlings annually, 30 percent of which are fruit trees. As of 1981, 3 000 hectares of croplands had been improved through tree planting, and an additional 4 000 hectares were under erosion control (Behmel and Neumann, 1982).

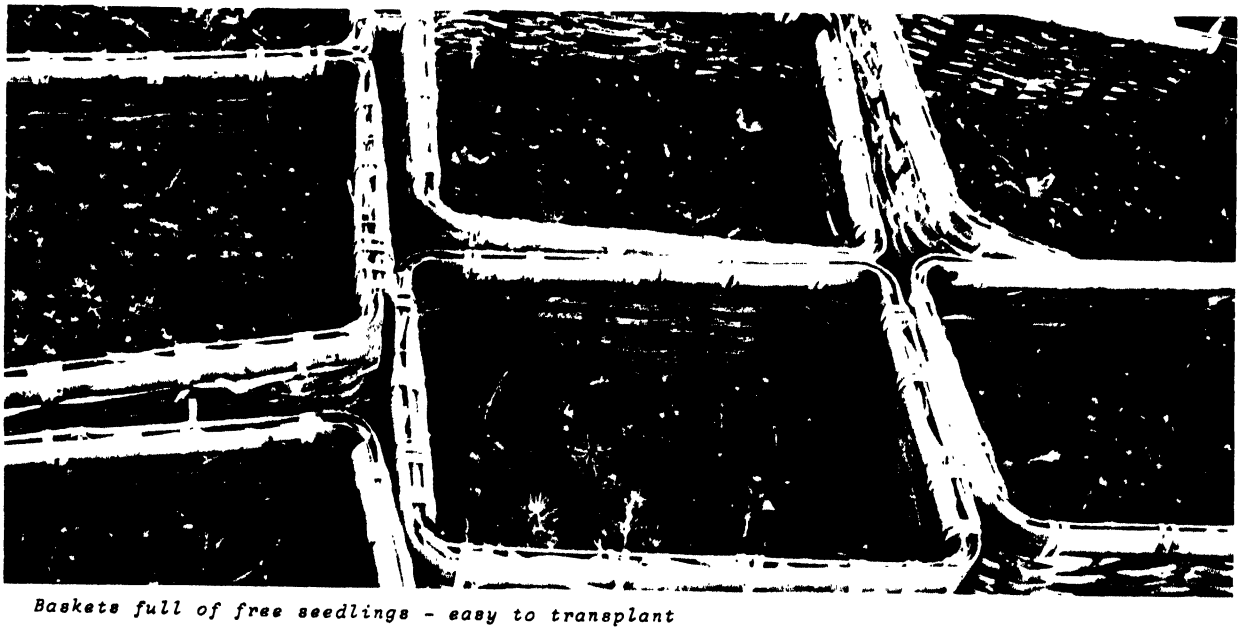
Wide variations in base-level soil fertility, cropping patterns and agricultural practices from site to site will result in variations in the agricultural response to tree planting.

Nonetheless, a substantial body of research suggests that growing trees with agricultural crops provides benefits in terms of improved soil fertility, water retention, soil temperature and other related characteristics which affect crop production (Chandler and Spurgeon, 1979; de las Salas, 1979; MacDonald, 1982; Huxley, 1983; Arnold, 1983; Nair, 1984; Catterson, 1984).

It has been reported that in an Azadirachta indica windbreak project in the Majjia Valley of Niger, millet yields have been increased by 23 percent. Between 1975 and 1980, over 100 linear kilometres of trees had been planted, each kilometre of windbreak protecting at least 10 hectares of agricultural lands (Bognetteau-Verlinden, 1980). Studies in Burkina Faso and Senegal have indicated increases in millet yields by an average of 50 percent on land under Acacia albida tree canopy (Direction des Eaux et Forets, 1965; Felker, 1978). Another study in Burkina Faso which compared 47 tree-enhanced plots with 48 control plots reported average increases in millet and sorghum production of 10 percent on the former (Wright, 1983; see also: Gulick, 1984).

On the other hand, while trees can generally be a productive part of a farming system, tree planting may have negative impacts on crop yields and trees may hinder livestock production. The extent to which farmers actually plant trees on their lands will be determined by their perceptions of the balance between the costs and benefits which are involved. Where trees and wood are plentiful, the reasons for planting them may not be compelling. Where trees and wood are scarce, tree cultivation may require significant sacrifice and effort, and these perceived costs may be greater than the benefits which may accrue.

It is characteristic of these types of farm forestry programmes that farmers bear complete management responsibility for growing trees on their holdings. The contribution of supporting agencies is confined to providing technical advice and occasionally inputs such as seedlings.



Baskets full of free seedlings - easy to transplant

Since many of the outputs can only be obtained by having trees as part of the farm system, tree growing at this level often coexists with communal forestry. In the hill areas of Nepal, for example, farmers tend to grow fodder and fruit trees on their own land, and rely on communal forests and plantations for their supplies of fuelwood and construction timbers. In many situations, however, planting at the household level may be preferred over communal woodlots because of the greater control this permits over management and access to the benefits. It has been widely observed that where private and communal tree management coexist, survival and growth rates are higher in the former.

6.3 Strengthening Household Tree Management

Farm forestry activities for household production must make sense both at the project level and from the perspective of individual farmers. Where programme objectives coincide with local priorities, prospects will be promising. The scope of these programmes, however, will be determined by the extent to which rural women and men believe they will benefit by them.

There is much to be gained by concentrating efforts on making incremental improvements to existing land-use systems. In many cases, indigenous land-use and tree management practices may provide an important base for the introduction of other innovations. Technical interventions which are compatible with existing practices have the advantage that their impact may be more easily perceived and their effects more readily understood by local farmers (Raintree, 1983).

In Costa Rica, where traditional agroforestry systems are already well-developed, interventions have focused on "fine tuning" these systems in order to increase their overall productivity. Farmers have volunteered, for example, to test new types of shade trees for their coffee plantations (Budowski, 1983).

It may be useful to investigate if land-use practices in other areas are evolving in a way in which farm forestry can be incorporated. In Kenya, for instance, increased pressures for agricultural lands reduced the number of easily available trees. Wood has undergone a transition from being an abundant free good to a commodity of value, to be protected and perpetuated (Brokensha et al., 1983a). A recent study of the tree cover in the Kakamega District, which is under tremendously high population pressures, discovered that nearly 80 percent of the rural households had planted trees on their land. Perhaps even more importantly, a large number of the farm households raised tree seedlings in their own nurseries. An unexpected finding was that there appears to be a direct correlation between population densities and tree cover: the higher the population, the greater is the area of land devoted to growing woody biomass (van Gelder and Kerkhof, 1984; Bradley, 1984).

Even within the same community, some people will be more interested in planting trees than others. Their interest may be defined by their land ownership position, their financial status or by their access to other resources such as seedlings and technical advice. Ultimately, a farmer will be interested in growing trees if there is a technical option available which is responsive to the household's needs.

Farm forestry programmes should therefore reflect the needs and potentials of individual farm units. Since these will be different from household to household, introducing several different strategies will allow farmers to choose an appropriate option, instead of having to decide whether or not they wish to adopt a single technique (Raintree, 1981).

In some cases, especially where rapid changes in the rural sector have been taking place, farmers may not yet perceive the emergence of fundamental land-use problems which require their attention. There may be no perception that fuelwood shortages require long-term strategies to meet future demands. In such situations, it is desirable to link the solution of unperceived or low priority problems with the solution of perceived high priority problems (Raintree, 1983). The introduction of multi-purpose tree growing systems can be especially appropriate.

In practical terms, the backbone of most programmes will be the quality and availability of technical advice to the appropriate women or men farmers as well as the extent to which these farmers can easily obtain the desired types of planting materials. Although rural people can often obtain naturally germinating seedlings, nurseries may be able to provide a broader range of species, including improved varieties or introduced exotics (where appropriate) as well as seedlings which may otherwise be difficult to germinate and raise. Seedlings which are grown under controlled conditions also provide a degree of quality control and selection from strong parent stock. The nursery can also be a focal point for demonstration and extension activities.

Better seedlings from the nursery?

It is extremely important that nurseries are responsive to the local requirements. They must be able to produce seedlings which are in demand and which are environmentally appropriate. Demands for wood products, fruits, nuts, edible leaves and shoots, animal fodder, tannins, dyes, bark, fibres, medicines and various gums and oils can be a significant incentive for people to plant trees. The most appropriate mix of species which a nursery may stock can only be determined if local people are directly involved in the species-selection process. This can be accomplished through the use of surveys, interviews and discussions which incorporate the views of all segments of the

population, particularly of women, who are most often responsible for collecting fuelwood, food, fodder and other forest products.

Women know fuelwood

When new types of trees or new ways of incorporating trees into agricultural systems are introduced, demonstration plantings will almost certainly play an essential role in establishing local confidence and support. Regardless of the theoretical advantages of novel planting techniques or of new species, or the fact that they may be widely used in other parts of the world, local farmers are likely to view such approaches sceptically until amply proven. Once men and women farmers are convinced of the advantages of new techniques or species, however, widespread adoption can follow very rapidly.

6.4 The Scope for Farm Forestry for Household Use

Farm forestry for household production activities which focused on single benefits such as fuelwood have often not proven sustainable over the long term. Programmes which have incorporated multipurpose trees into agricultural production systems have received broader support. Agroforestry strategies can help reduce soil erosion and increase agricultural production because of complementary effects between trees and crops, and can also improve the human environment.

Encouraging farm forestry in order to meet subsistence needs is especially appropriate where trees may improve the conditions of people living at the margins of rural poverty. Because the approach involves the optimal integration of trees and agricultural crops (not the maximization of the production of woody biomass as in most market-oriented farm forestry approaches), the trade-off between food crop and tree crop production will seldom be an issue. Because these strategies are characterized by low intensities of management, the availability of labour will not generally be a problem.

There are several important constraints to this type of forestry, however, which are recurrent in other social forestry strategies. Perhaps the most significant is the question of land and tree tenure. If farmers are unable to ensure that they will see the benefits of their investments in planting trees, they will usually be unwilling to invest; if the size of a farmer's landholding is very small, there will be important trade-offs between trees and agricultural crop production, as trees generally do not produce the basic staple food.

Chapter 7

Farm forestry for the market

Where there are commercial markets for wood or for other tree products, farmers may undertake a more intensive programme of tree management and cultivation to produce goods for sale. Under these circumstances, trees assume the character of many cash crops: they must be planted, harvested and marketed, while the addition of other inputs such as fertilizers and irrigation may increase the farmers' returns.

Experience has shown that market demands can provide significant incentives for farmers to take up tree growing. There can be a number of advantages in terms of resource allocation. Tree crops can be more profitable than alternative crops; they can allow an economic use of land unsuitable for agriculture; they may be more easily adapted to family labour availability than other farm activities. As they do not perish if not harvested at a particular time, trees can be left growing until market conditions are favourable and can thus be less financially risky than annual crops. Once established, trees may also survive times of drought better than annuals.

Soil fertility - a decisive factor

On the other hand, returns from sales of forest products begin to accrue only after a period of some years; many farmers may not be able to forego income and tie up land and other resources for so long. The relatively lengthy production period may also entail risk to the farmer in certain circumstances of land or tree tenure, or if future market conditions are liable to change adversely. Tree management may also involve periodic capital or labour inputs beyond what the small farmer can secure from his own resources.

The extent to which farmers respond to the incentives offered by the commercial market in any particular area will thus depend on how the returns compare with other income generating strategies, as well as on the farmers' productive capacity and access to necessary inputs. Support services which provide access to credit and markets may prove to be as important to this type of tree growing by rural people as is access to technical forestry advice and planting stock.

Commercial farm forestry can also be important on a broader scale than just the individual farm. It can generate additional employment and income in the rural areas. In addition, the private sector is usually a more efficient producer of goods and services than the public sector, and because of this, farm

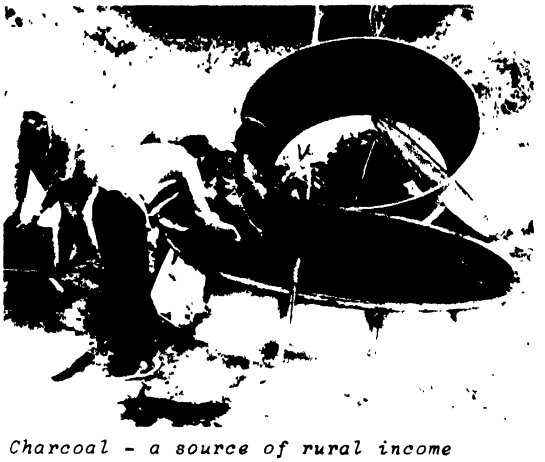
forestry is often much more productive than state-managed plantations. Finally, if a farm forestry programme is properly designed, it can contribute to meeting a number of social as well as environmental objectives.

Tree growing by farmers to produce goods for sale is not new. Acacia senegal, for example, has long been cultivated as a fallow period crop in Sudan, and elsewhere, to produce gum arabic. This product has been commercially traded since at least 4000 B.C., and its trade has for some time been subject to certain control and marketing mechanisms. In contrast, much of the recent increase in commercial farm forestry has been in response to emerging markets which as yet lack formal structures.

7.1 The Informal Wood Economy

In many areas, as forest resources have become increasingly scarce, wood has gradually entered into the market economy. Growing quantities of fuelwood, charcoal and basic structural timbers are traded by the informal sector. Market "throughput" is seldom recorded in national accounting exercises. Nonetheless, these markets are sometimes quite substantial and have provided a significant incentive for farmers to take up farm forestry.

The development of wood markets is particularly notable around urban areas where there are sometimes complex networks of fuelwood and charcoal producers, distributors, sellers and buyers (Morgan, 1983). Charcoal production can be an important source of income and employment in rural areas because, unlike fuelwood, it can be economically transported great distances. Although charcoal production can place serious pressures on fragile savannah ecosystems, in other areas it can be a reasonably sustainable activity.



Charcoal - a source of rural income

Some programmes have successfully introduced farm forestry by encouraging smallholders to plant trees to meet such emerging market demands for fuelwood and for charcoal. In Haiti, farmers have been quick to undertake cash-crop tree growing because of urban demands for fuel and building poles. The programme of farm forestry followed earlier communally-based efforts which were abandoned because of the lack of any strong traditions of communal cooperation and land ownership. There are, however, strong traditions of private ownership, and many families have access to land, much of which is unsuitable for agriculture.

While other tree growing programmes in Haiti have emphasized the environmental benefits of tree planting, this scheme emphasizes financial profitability. Non-governmental organizations have assumed most of the responsibility for starting tree nurseries, and seedlings are supplied to farmers at cost. Between 1981 and the end of the 1983 rainy season, around 4 million trees had been planted by about 6 000 participating households. It is still too early to speculate on how profitable the activity will be, and some critics have been concerned about the technical advice and overly optimistic expectations given to participating farmers. It is, however, anticipated by project managers that farmers will have little trouble tapping into the charcoal and fuelwood markets (Murray, 1983).

Perhaps the single most widely reported farm forestry programme is in the state of Gujarat, India, where the markets for construction poles and fuelwood have provided a strong incentive for farmers to plant trees. This scheme was started by the state's Forest Department in the early 1970s as one component of its social forestry programme. The original idea was that farmers would plant seedlings on unused or marginal lands on and around their holdings.

As the project evolved, some farmers realized that it was even more profitable to grow trees on agricultural land than to grow the usual cash crops such as cotton and tobacco. Trees turned out to have several important advantages over conventional crops. Farm forestry was less labour intensive, and labour requirements could be spread out more evenly over the year since trees could be harvested during the dry season when the demand for labour was slack. This reduced total labour requirements and simplified farm management.

Tree farming, primarily of eucalyptus, has in fact emerged as an extremely lucrative exercise in Gujarat. An early financial analysis of the tree farming activities of one of Gujarat's first farm foresters (who intercropped eucalyptus and cotton during the first year) identified investment costs of around $1 700 per hectares and total returns, after five years, of $5 900 per hectares.

Trees - a cash crop in India

While the Internal Rate of Return was calculated at 129 percent for the first rotation, it was estimated to increase to 213 percent for each successive coppice crop (Gupta, 1979). These return forecasts were much higher than those for any other crop. In some cases, farmers have undertaken tree farming because, in addition to these high potential returns, their ability to produce the next best paying cash crop, cotton, has

been seriously constrained by the government's Cotton Marketing Board.

Farmer response to the profitability of this type of farm forestry has been enthusiastic. The rate of distribution of government produced seedlings increased four-fold between 1975 and 1979 from 12 million trees per year to 48 million per year, doubled again to 100 million by 1981, and yet again to 195 million by 1983. For the state's rural population of around 25 million, this represents about eight seedlings per person during 1983.

Over 5 percent of Gujarat's farming population has become involved in farm forestry, and by 1983 the equivalent of over 150 000 hectares had been planted. According to one estimate, around 22 percent of the seedlings were distributed to farmers on holdings of less than 2 hectares, although other studies show a much lower percentage of tree planting done by farmers with small holdings (Patel and Doshi, 1984).

Initially, farmers could obtain as many as 10 000 seedlings free. At a cost of about $2 per hundred seedlings, this represented a significant subsidy for farmers who chose to take advantage of the programme -- considering that the wage rate of an agricultural labourer is around $1 per day. Because farmers on large landholdings are more able to take advantage of these subsidies and because of consequent concerns about equity issues, the number of seedlings distributed free was reduced to 3 500 and is likely to be reduced further to 1 000. Farmers who want to plant more seedlings can buy them from the Forest Department or from other private farmers who have started their own nurseries. Private nurseries have greatly supplemented Forest Department seedling supplies.

In this project, the interest of farmers in planting trees was greatly underestimated in the project planning process. In 1979, when a proposal for funding a new phase of the social forestry programme was submitted to the World Bank, it was envisaged that farm forestry would be a relatively small component of the project. In the economic analysis, fuelwood and construction poles were "proxy-priced" because there was an incorrect impression that they were non-marketed commodites. By the end of the 1984 planting season, however, four times as many seedlings had been distributed to farmers as had been planned.

Nonetheless, there are indications that this tree-planting boom cannot continue indefinitely. Within the next few years, many trees planted since 1979 will become mature enough to sell, and there is the real possibility that the market will experience a glut of construction poles and fuelwood. Falling market prices would discourage farmers from continued plantings, and lands might be converted back to other cash crops unless other markets for wood could be tapped or developed.

Saturation of the construction pole market would probably lower the price of fuelwood and make it more accessible to people who might not be able to afford it otherwise. New wood-based industries might be established to take up some of the slack.

Nevertheless, though farmers have some flexibility in responding to conditions of oversupply, as they can leave their trees in the ground until an equilibrium in the market is restored, such disruptions could be very difficult for many farmers to accommodate.

The risk over the next several years will be especially high for small farmers who lack significant marketing experience. Market instabilities may leave them vulnerable to exploitation by middlemen, and it has been recommended that alternative marketing arrangements be explored to reduce these risks. Such arrangements might take the form of tree-growers' cooperatives, a few of which have already been established in areas where farmers have been particularly enthusiastic about farm forestry (Dewees, 1983).

The Gujarat farm forestry experience has been criticized in some quarters on the grounds that the original primary objective of the activity was to produce fuelwood for local use, not the construction poles for sale which have formed the actual main product. However, farmers have had little interest in growing trees explicitly for fuelwood when the markets for construction poles are profitable. A substantial but yet unmeasured amount of fuelwood is being produced, but mainly as a by-product of construction pole production from the thinnings, "lops and tops" and non-marketable poles.

Different variations of the Gujarat programme have been adopted in other Indian states. One of the largest programmes is in the state of Uttar Pradesh where seedlings are, for the most part, provided to farmers at 50 percent of cost. Seedling production has had to be greatly increased in order to meet demands. During the 1982/83 planting season, 156 million seedlings were distributed - nearly 30 times the planned number.

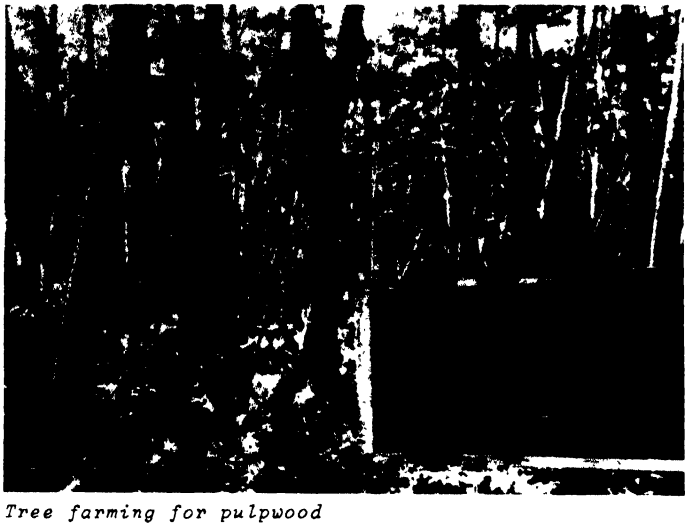
Perhaps the most important issue highlighted by all such recent programmes to encourage commercial farm forestry is the need for a more accurate understanding of the informal wood economy at the stage of project planning. In some cases, inadequate knowledge has not been a serious constraint to project implementation so far because the size of the wood markets was underestimated, and the programmes have had the flexibility to respond to market demands. In other cases, insufficient understanding of the supply/demand situation has led to an overestimation of the extent of market demands, and this has seriously limited the ability of a project to meet its objectives.

Projects planned without adequate market information may easily fail. The project in the Ilocos region of Luzon island in the Philippines was a scheme to encourage farmers to plant Leucaena to supply fuelwood for curing tobacco. Project planners had not observed that tobacco curing enterprises already had access to an assured supply of wood through the informal sector. Farmers had developed traditional systems for producing fuelwood on small woodlots and had little interest in adopting the new and uncertain approach which was being promoted through the project (Wiersum and Veer, 1983).

7.2 Linking with the Formal Wood Economy

In some cases, reliance on the informal market can involve farmers in risks they find unacceptable. Their risks are perhaps highest when an inadequate transportation infrastructure limits their ability to tap into the market, or when production closely matches demand and the market is in transition from a "seller's market" (where the producers have a degree of control over the price) to a "buyer's market" (where the consumers assume this control). Their risks are least when they can be assured of a good market price for their production and where markets are easily accessible.

Where the informal sector is unable to ensure that farmers will receive adequate prices for their products, an alternative is to design programmes which link farm forestry production with formal market demands for wood and tree products. These linkages may take the form of marketing agreements between farmers and wood-based industries such as papermills, sawmills and fibre-based industries.



Tree farming for pulpwood

This strategy has been attempted with some success in the Philippines. In 1968, at the initiative of the Paper Industries Corporation of the Philippines (PICOP), farmers were encouraged to undertake tree farming for pulpwood production. The programme was initially conceived to offer an option to slash and burn agriculturists who were encroaching on PICOP's forest concessions. It was also an attempt to raise rural incomes and so avoid the social tensions which would otherwise have emerged as a relatively well-off class of industrial workers settled in a generally poor rural region.

An agroforestry system was developed as part of the programme, integrating livestock and subsistence crop production with the growing of Albizia falcataria on 10 hectares plots. PICOP provided farmers with seedlings at cost. Technical assistance was geared toward increasing the efficiency of the agroforestry system and incorporporated elements of PICOP's own industrial plantation experience. Smallholders were guaranteed a minimum price for their wood, and PICOP also agreed to pay transportation costs. The required size for the trees was reached in eight years.

The programme gained significant momentum in 1972 when PICOP entered into an arrangement with the Development Bank of the Philippines (DBP) to develop a loan programme for smallholder tree farming. Loans were offered to smallholders to finance 75 percent of the costs of plantation development and maintenance. Farmers with titled property could receive loans at a 12 percent

rate of interest; farmers with unsecured property could receive loans at a 14 percent rate of interest. PICOP continued to guarantee a minimum purchase price for smallholder production, but allowed farmers to sell wood to other outlets if they could get a better price.

The scheme proved popular. By 1981, the programme supported 3 800 participants and covered 22 000 hectares. Around 30 percent of the farmers had taken advantage of the credit programme (Magno, 1982).

Although the programme was intended to incorporate trees gradually into an agroforestry system, in practice nearly all of the farmers involved in the loan programme planted the whole of their property with Albizia. Rather than stagger their planting schedule over several years, around 80 percent of the project's participants planted all of their property in the first year. The farmers cited lower labour costs for clearing, planting and management in even-aged stands as reasons for doing so.

The result was that smallholders needed to harvest their entire plantation at the end of the 8-year rotation period. A staggered harvest would have allowed them to rely on household labour, but instead more expensive contract labourers had to be employed. In order to cover these costs, smallholders argued for a higher millgate price (Development Bank of the Philippines, 1981).

Nonetheless, a post-project financial evaluation of the PICOP programme suggested that smallholder farm forestry has been extremely profitable. Under the most typical management system, internal rates of return ranged from 22 to 31 percent, depending on the yield of the smallholding. These returns were very sensitive to wage rates, however, as labour accounts for most of the cost.

Among the important lesson from the experience has been that projects which include loan components must have the flexibility to respond to changes in the smallholder's capital requirements. For instance, the costs of harvesting had not been included in the loan programme. It is also crucial that the timing of loan disbursal closely reflects the timing of capital and labour requirements for harvesting (Hyman, 1983b).

The PICOP experience suggests that there is the potential for meeting industrial wood demands through farm forestry. Building on this experience, the PICOP model has been used by a number of other industries to encourage smallholder tree farming for timber and charcoal production. Evaluation of the project has also found that it encouraged farmers to plant additional trees without the incentive of the loan programme. Around a third of the original loan recipients planted, on average, an additional 9 hectares of trees for pulpwood as well as for the production of coconuts and fruit.

7.3 Farm Forestry on Public Lands

Most commercial farm forestry activities have been carried

out on private lands where smallholders have been assured of receiving the benefits of tree growing. Recently, a number of programmes have been developed to utilise commercial farm forestry as a means of providing income to landless people by allocating parcels of state owned land to them for this purpose, thus offering them security of tenure in areas where markets for tree products exist.

In the Indian state of West Bengal, a programme has been initiated which involves giving landless people official title to small plots of government-owned wastelands. Farmers are allocated half-hectare plots close to their villages and are provided with seedlings and fertilizer. As most of the plots are contiguous, the farmers are able to take advantage of group efforts for protection and eventual marketing. The proceeds from the effort belong to them. In 1981 and 1982, a total of around 400 farmers were involved in this effort (Misra, 1983).

Similar tree tenure schemes for the landless and poor have also been undertaken in the states of Rajasthan, Gujarat and Himachal Pradesh in India. Under all of these programmes, landless or minimum-resource farmers are allocated rights to grow trees on public lands. Often, the beneficiaries are given a certain amount of money for their initial investment and are provided other inputs, such as seedlings, free of cost. In some cases, they are also given small incentive payments on the basis of survival rates. Intermediate products such as grass, branchwood, fruit and seedpods generally belong to the leaseholder, while the final harvest may be shared with the forest department.

Communities in other countries have also been allocated state-owned lands for farm forestry. In the Philippines, upland communities can obtain 25 year leases on unutilized forest lands to convert them into tree farms. These areas are subdivided into 1 hectares plots and are allocated to individual farmers who are supposed to plant at least 80 percent of their land with trees. The Bureau of Forest Development provides seedlings and technical assistance. By 1980, over 10 000 hectares of land had been allocated. In this programme, however, farmers tend to be more interested in planting food crops because of the uncertainty of the markets for tree products.

At present there is insufficient experience with such projects to assess them. Their particular attraction is that they offer a means of including the landless and the poor in farm forestry. They can also provide a cheaper and possibly more effective long-term solution to the problem of the protection and management of marginal lands than can other publicly-managed activities. Their limitation is that ultimately they can have only limited impact because they can absorb so few of the enormous number of landless people. There is also a danger that these projects may exclude other landless people from lands which they formerly used, thus reducing their access to fuel, fodder, building materials and so on. These schemes need to be closely monitored over the next several years.

7.4 Equity of Access to Commercial Farm Forestry

When circumstances are favourable, farm forestry can produce substantial financial benefits for farmers. This in itself can hardly be criticized. Since the encouragement of economic activity in rural areas is a primary objective of many national development strategies, there can be no rational objection to farm forestry solely on the grounds that it is profitable to those who engage in it (Foley and Barnard, 1984). Nevertheless, farm forestry programmes can cause problems of equity and have been widely criticized in India on these grounds (Shiva et al., 1981, 1982; Centre for Science and Environment, 1982).

It is an undeniable feature of farm forestry that owners of larger landholdings are usually most able to participate. Wealthier farmers have the greatest capital and labour resources at their command and have the largest number of alternatives open to them. They may have the option of using prime agricultural lands instead of marginal lands for tree planting and will be able to afford fertilizer and irrigation inputs to increase production. They can also afford to hire additional labour if this is necessary.

Perhaps most importantly, they are able to take the risk of investing in tree planting. They can divert some of their lands to tree farming, with little impact on the production of other cash and food crops, and can wait longer for the benefits of tree growing to accrue than can owners of smaller farms. When the time comes to harvest the trees, they will often be in a strong bargaining position to obtain a good price for their products, and they will almost always be in a better position to take advantage of any incentives which may be provided to encourage farm forestry.

Too poor for farm forestry?

Farmers on small holdings or on marginal lands, on the contrary, are often unable to take advantage of the opportunities offered by farm forestry for the market. A considerable proportion of their land will always be required for subsistence crop production, and it is very likely that there will be little left for farm forestry - regardless of its potential benefits. Nor can a limited-resource farming family take the risk of jeopardizing its economic position by using scarce capital and labour resources on farm forestry which will only show a return in 5 or 10 years. Their lack of access to additional capital and labour further reduces their ability to engage in farm forestry on a substantial and competitive scale.

The fact that landed and wealthier farmers are more able to participate is a characteristic of many development activities, not just farm forestry. Investments in these types of lucrative ventures can be justified in financial terms, but the fact remains that equity and distributional objectives are especially diffficult to address in activities which are designed to encourage capital formation.

The challenge for support programmes is to find ways of broadening the impact of farm forestry. This means that resources should not be spent in a way which preferentially favours the wealthy. The indiscriminate distribution of free seedlings, for instance, provides disproportionate subsidies to wealthier farmers who have the land for planting large numbers of trees and who could probably afford to buy seedlings. It is also probable that the wealthier farmers will not need concessional loans because they have access to commercial financial markets. Support, therefore, usually needs to be directed toward poorer farmers who would otherwise not be able to grow trees as a source of income.

7.5 Other Social Issues

Farmers involved in tree growing to meet market demands will naturally try to get the highest possible price for their products. The highest wood prices are usually commanded by urban markets, so farm forestry products often end up in the cities. Even where wood is sold locally, it will only go to those who are able to afford it. The landless and the poor, with the most urgent needs for wood products, do not have the purchasing power to afford it.

There is also the possibility that farm forestry may even reduce the rural poor's access to fuel and fodder. This may be the result where customs permit farm labourers to collect crop residues from fields after the harvest. If these fields are planted with trees, and access to them is consequently restricted, alternative sources of fuel and fodder may have to be found.

In extreme cases, farm forestry may have other negative social impacts. It may displace rural labourers in the agricultural sector. One of the reasons for growing trees in India appears to be that they require less labour than other types of agricultural crop production, thus reducing both labour costs and the problems of farm management. Farm forestry programmes could therefore reduce the economic opportunities of the neediest people in the rural areas, since it is the landless and the poor who rely on agricultural employment as a means of earning a living.

Farm forestry has also been criticized in some cases on the grounds that it diverts the use of agricultural land from food crops to tree growing. In principle, at least, this could lead to a decrease in total food production and increases in food prices. However, this is an issue that is not unique to farm forestry. It is equally likely to arise from the introduction of other cash crops. Nonetheless, it is clear that farm

forestry is not necessarily an appropriate vehicle for addressing social inequities. The claim that growing trees for profit will easily or quickly benefit all sectors of the community is not realistic.

Farm forestry can be justified for many valid reasons, but equity and distributional objectives are not especially credible ones. There remains a strong obligation on programme designers to ensure that the introduction of farm forestry does not make the position of the rural poor worse than it might otherwise have been.

7.6 Environmental Issues

Critics have also voiced some concern about the environmental impacts of farm forestry programmes. Tree plantations do not necessarily result in environmental improvement nor do they automatically improve the condition of the soil. Indeed, there is some evidence that high-yielding monocultures grown on short rotations may reduce the soil's fertility if insufficient attention is given to proper establishment and management practices (Evans, 1984).

Farmers who grow trees for the market will normally be interested in maximizing their benefits and not necessarily in improving the environment. The choice of sites used for trees will ultimately be made based on the relative capacity of tree growing to generate an income compared to other land uses. Though it may be desirable from an environmental perspective to plant trees in degraded areas, this may not make economic sense to the farmer.

In the hills of Nepal, where few markets exist for farm forestry products, most farmers plant trees on steep hillsides and on the boundaries of upland fields (Bhattarai and Campbell, 1983). In contrast, over half of the farmers who have planted trees in Gujarat have planted them in block plantations. Three-fourths of these block plantations were planted on agricultural crop lands, one half of which were formerly used for growing food crops and one half for growing either food or cash crops (Sardar Patel Institute, 1985).

Land that needs trees

For these reasons, it can be argued that farm forestry programmes will not automatically achieve many of the more ambitious environmental objectives which promoting agencies have sometimes set. This does not mean that no beneficial environmental effects

will accrue from tree growing for the market. But it does suggest that trees are unlikely to be concentrated in the places which are most at risk. In many cases, the areas under the worst environmental threat are not even privately owned, so that farm forestry as a means of protecting them is effectively ruled out.

7.7 The Scope for Farm Forestry for the Market

Although it has been criticized in certain respects, farm forestry has considerable potential for producing additional supplies of wood to meet commercial markets and for generating income for those able to participate. Farm forestry programmes can be particularly efficient in comparison with other tree production strategies. In India, for instance, the public sector costs of growing trees through farm forestry are about a fifth those of government forestry plantations.

One of the major advantages of farm forestry programmes from the programme planning point of view is that it genuinely decentralizes decision-making, giving it to those most concerned. Farmers will make their own decisions on the inputs they wish to make and on the level of production they wish to achieve.

If tree planting is truly financially viable, farm forestry programmes will tend to become self-sustaining. The need for demonstration plots, free seedlings, subsidized credit and other means of encouragement will diminish as it becomes clear that farm forestry can be a sustainable means of generating incomes for rural households. The main task of support programmes then becomes that of identifying viable opportunities for farmers to engage in tree growing for the market, supplying market information and technical advice in the initial stages and, where necessary, providing access to credit and marketing services.

Part 3

Developing a sound basis for the introduction of rural forestry innovations

Chapter 8

Programme planning and design

Developing a realistic set of goals and objectives upon which to base planning of farm and communal forestry activities can be complex, for these objectives and goals are usually much more far-reaching than those of conventional forestry approaches where progress is measured by comparing physical achievements with targeted goals. But farm and community tree growing programmes are not ends in themselves, and measures of physical progress only incompletely reveal project impacts and results. The number of trees planted, the number of foresters trained, the number of roadsides reforested in themselves tell us little about an activity's useful effect.

Increasing the number of trees in an area in order to produce fuelwood may be pointless if it is not related to local needs or markets. Similarly, a project should not be designed to protect a watershed as an end in itself. Rather, watershed protection should be seen as a means of attaining other social and economic goals. These could include: sustaining local or downstream agricultural production by maintaining soil fertility and reducing downstream flooding, protecting life and health through maintenance of water quality, or any number of other goals associated with the fundamental objectives and needs of local communities.

Although phrases like "social forestry", and "forestry for local community development" have become fixtures in the vocabulary of development planners and foresters alike, there are nearly as many meanings to these terms as there are projects they have described. Projects have frequently simply been labelled social forestry to imply that they are intended to address (often preconceive) social constraints.

As was pointed out in Chapter 4, the term community forestry refers to a group of objectives, rather than to a single development norm. These multiple objectives may be divergent or even conflicting. While the aim of one activity might be to provide a means for rural people to take advantage of lucrative commercial wood markets, another activity might have an environmental objective or increased agricultural production, while still another might be intended to supplement household wood supplies.

The purpose of planning is to provide a clear picture of what the objectives really are and of the relative merits of different ways to achieve them. There are few activities which will be able to address the multiple needs of all the different groups of potential beneficiaries, since local conditions often impose their own complexities and contradictions. Some objectives may even turn out to be incompatible with others. Few programmes will be without their negative effects, and the

process of project design will very likely involve a series of compromises and judgements about what is most acceptable and feasible to all concerned.

Successful planning of farm and communal forestry programmes must be a collaborative effort. The process should involve local people, particularly the intended men and women beneficiaries, as well as representatives from implementing agencies and funding organizations. This type of planning is seldom straightforward or simple. It may need the creation or strengthening of local level planning capabilities before it can succeed. However, experience has suggested that other more "top down" approaches will tend to reinforce the status quo; broad social objectives will usually not be achieved.

8.1 Project Identification

Forestry planning and management is a long-term process and requires a national policy framework for farm and communal forestry which reflects a sustained commitment to rural development. Where there are serious constraints to tree growing, the government must be willing to support legislation to remove them. It may be necessary to change land tenure systems to favour tree cultivation or remove constraints which limit market demands for wood and other tree products.

Although it is highly desirable for governments to develop overall land-use plans when designing national development strategies, these plans should reflect local preferences and allow flexibility in local applications. There is danger that national governments (as well as development aid agencies) will fall into a self-reinforcing cycle which is not based on a true appreciation of local needs. Political pressures or international fashion can bring issues to the forefront. These can become incorporated into legislation, budgetary arrangements, lending criteria, and public policy, and may determine developmental priorities -- regardless of whether or not these priorities are especially relevant to rural people's needs.

The resulting projects can often appear to be in search of a justification. Residents may simply not need more trees, but the political pressures on governments and aid agencies to support reforestation may result in the use of land -- perhaps more valuable for other uses -- for tree planting. The same pressures may further define what kind of trees are planted: fodder trees might be most appropriate, but fuelwood trees are planted instead.

In many countries, the need for foreign exchange is such a dominant concern that international assistance will be solicited for certain projects. Objectives are established and proposals are prepared, irrespective of local realities, in order to make them appear attractive to aid agencies. Locally prepared project proposals can often create an external impression that they are feasible even if they incorporate unrealistic or irrelevant targets.

The promise of quick results is another temptation to which those engaged in project preparation frequently succumb. Funding agencies have an understandable preference for projects which show visible results at an early stage. Rapidly implemented programmes may run into difficulties at a later stage if the basic research on which they have been based has been poorly conceived and carried out.

8.2 Project Planning

For all projects, but even more for projects involving the time span required by trees, there is a clear need for thoughtful and reasoned project planning. As discussed in Chapter 4, goals vary, and good project planning requires a clarity of purpose and the selection of a strategy which leads toward the chosen goals. Identifying this purpose requires knowledge of the project area.

In practice, collecting background information during project planning has often been the weakest feature of farm and communal forestry programme development. The result has been that many programmes have had unrealistic objectives and goals, and scarce resources have been misdirected. Lack of adequate information also carries the danger of obscuring real project successes. Programmes may be judged to be failures purely because they have fallen short of unrealistic goals.

It is unreasonable to specify or to try to predict the effects of a market-oriented programme without a thorough knowledge of the local markets for wood and wood products. Yet this basic information has often been lacking. In such cases, it is virtually impossible to make a realistic assessment of a programme's likely effects, particularly of who will benefit and who might suffer from whatever tree growing takes place.

Much of the criticism of farm forestry programmes in India, for example, springs from the fact that many projects have been implemented without a clear picture of the structure of market demand. As a result, they have evolved in directions and with consequences which were not foreseen by their promoters. With hindsight, it is clear that early market surveys would have made the outcome of these activities somewhat more predictable, and some of the criticisms could have been anticipated and perhaps obviated.

In the Sahel, also, a better knowledge of the wood supply and demand system could have resulted in more appropriate planning for village woodlot programmes. Among other things, an understanding of the rural wood economy should have resulted in a more broadly-based programme with an emphasis on other products in addition to fuelwood.

The extent and nature of background data necessary for effective planning depends on the scope and objectives of the programme. If the intention is to rely upon market incentives to encourage farmers to grow trees, then a comprehensive picture of the local wood supply and demand situation and links to the markets will be required. On the other hand, if programmes have environmental objectives, such as combating soil erosion and

degradation, it is essential to know why these problems are occurring.

An understanding of the existing land tenure situation is crucial to any type of forestry activity. Similarly, traditions which define patterns of tree tenure must also be understood. This type of information will require collecting anthropological or sociological data. Often, the intended beneficiary groups will be able to provide useful socio-economic information through interviews, discussions and informal surveys. At the same time, cross checking is essential because of the local perception that certain advantages might be gained by giving false information. This information process can be strengthened when the rural people themselves are involved in problem identification and information collecting.

Background information is a crucial part of sound programme planning, but it may not be readily available. Provisions for the proper design of surveys and for the resources necessary for carrying them out are essential. These surveys should be designed to collect only information which is needed. The over-collection of data makes any comprehensive analysis of baseline information particularly difficult and time consuming. The challenge is not simply to widen the scope of data collection, but also to apply rigour in defining the information which is needed for programme planning and to design methods for obtaining this information in the most effective and economical fashion.

8.3 Economic and Financial Analysis

Project planners are usually interested in whether a possible forestry intervention will meet certain economic and financial criteria. They need to know whether their investment is going to pay off in the long run and what kind of returns can be expected both to the economy as a whole and to individual smallholders.

Economic analysis measures what society gains or gives up as a result of a project. Costs are often evaluated in terms of the opportunities foregone, and thus are called "opportunity costs." Benefits are measured in terms of the goods and services which may become available to society as a whole as a result of a project. Financial analysis measures real monetary flows to and from the public and private sector individuals or entities involved in a project. Both economic and financial analyses will be needed for any project for which the use of public sector funds is being considered (Gregersen and Contreras, 1979).

Farmers are also interested in whether a project meets certain economic criteria. Their approach toward evaluating the impact of their involvement will be very different, however, from the approach a funding agency might take. Farmers are interested in knowing whether or not a particular course of action, which may involve tree planting, will benefit them in the short and long run, not whether a project is "economic" in the abstract.

Planners must understand that the farmers' criteria are different. As a result, a project may have to be modified to respond to the rural smallholders' economically-defined needs, possibly in a way which is inconsistent with the planner's perception of whether or not a project is economically viable.

One of the basic difficulties in carrying out a comprehensive economic or financial analysis is that the costs and benefits of a project, using either approach, may be difficult to assess. For instance, fuelwood is often a non-marketed commodity. In economic analyses, proxy-prices are assigned to it by assessing the cost of substitute fuels such as coal, kerosene, animal dung or crop residues, or by assessing the labour costs involved in its collection. The assumption is that alternative capital and labour resources are in fact good substitutes. This is not necessarily the case. As a result, fuelwood resources are inconsistently overvalued or undervalued in different analyses.

Environmental values are also difficult to include in economic analyses. Externalities such as watershed and habitat protection and soil conservation are widely recognized, but in many economists' minds, trees are valuable only if they can be cut down -- and not because of any environmental benefits which might accrue if they are left standing. Someone is paying for the effects of cutting down trees (or may be indirectly benefiting from the effects of planting them), but these costs and benefits are not reflected in the derived stumpage prices. In most cases, economic analyses include neither an analysis of negative nor of positive environmental impacts (World Bank, 1984).

It is easy to be critical of economic analyses for their deficiencies. On the other hand, there are few available alternatives which consistently address the same concerns and criteria for allocating funds of governments and international aid agencies.

8.4 Economics, Tree Growing, and the Rural Farmer

The costs and benefits of planting trees tend to be assessed quite differently, depending on who does the assessment. The interests of a forest department in promoting agroforestry systems may reflect a desire to slow environmental degradation or to stabilize systems of land-use at low costs (Romm, 1980), while farmers are probably much more interested in immediate benefits such as increased crop production and may be unwilling to assume the cost of these broader social and environmental objectives. Taungya systems which may lower costs of tree planting for the forestry services may at the same time impose increasingly unacceptable costs and constraints on farmers (Seth, 1981). It has been found, for instance, that taungya systems in southern Nigeria often involve more physical labour, generate less income and provide less security to farmers than the shifting cultivation systems which taungya was intended to replace (Ball, 1977).

Many of the costs and benefits by which farmers evaluate different productive strategies are not defined by the market. Their interests are defined by how well their basic needs are being met: is there food, shelter, clothing ? is the family healthy ? is the farm's productive capacity generally able to meet their wants ? and so on. In accepting a new strategy, the labour costs to women and men farmers during various seasons, compared to other labour demands during those seasons, will be a key issue. Farmers will also take into account whether a change in their system of production, which might improve their situation if it worked, would leave them much worse off if it failed.

Understanding risk assessment from the perspective of the smallholder is essential if project planners are to gauge whether farmers will be willing to adopt new systems of production. Can failure be adequately compensated? Can the agricultural economy return to its earlier level of subsistence production should a forestry intervention fail? What will be the cost to society? To the farmer?

To a certain extent, the farmer's perception of risk is defined by an implicit and often very high discount rate. A tree planted this year is much more valuable to a farmer in 2 or 3 years than in 10 or 15 years. There are, of course, exceptions to this generalization. Farmers may plant trees with the intention that their benefits will accrue to them in their old age, to their children or even to their grandchildren.

Whether or not a particular tree planting activity will directly benefit a rural smallholder in the short term will be an important factor for planners to consider. One of the advantages of using exotics and fast growing tree species is that they are responsive to the farmer's high discount rate. They provide returns after a few years, and the farmer's risk of making an investment in an alternative production strategy is somewhat lessened. The development of quick return products such as mushrooms is also an important strategy when accompanied by appropriate market linkages.

Risk aversion with respect to tree planting will also often be a function of the size of a farmer's landholding. Tree planting is riskier for the small farmer because if the trees die, the alternative means of income generation are limited by the farmer's landholding size. Owners of larger landholdings may not be faced with the same constraint because they have enough land to cultivate a number of other crops.

The fact that farmers on large landholdings are more able to divert land for tree planting, and can plant more trees than smallholders, often makes the achievement of distributional or equity objectives difficult. The problem is made even more complex if tree planting interventions are to be used to have a positive distributional effect on the disadvantaged sectors of the community. Tree planting interventions will tend to be most successful where they are targeted at groups with common economic concerns and objectives, defined by their access to and use of capital and labour resources (Arnold, 1983).

It is also essential that the farmer's analysis of potential profitability be based on an understanding of changing market conditions. Especially where tree growing is introduced on a large scale, the estimated financial returns at the beginning of a project may be greatly reduced over the life of an activity which has any impact on reducing market scarcity. Planting around 600 million trees in Gujarat over the last few years is very likely to have an impact on scarcity when they become marketable, and estimated returns may well not be realized.

8.5 Monitoring and Evaluation

Project monitoring and evaluation activities are necessary for enabling project management to chart and understand the progress of any forestry sector intervention. Primarily, the process enables a project's management to take corrective action in response to problems when they arise during implementation.

Monitoring measures a project's outputs and its effects against established criteria. It can be quite straightforward: the completion of scheduled tasks -- the construction of nurseries, the production of seedlings, etc. -- as an indication of operation and performance. Periodic reports of progress in completing these tasks need only be collected, processed into a useful format and transmitted to the appropriate level of management.

Evaluation is the analysis process which links monitoring to improved project management and performance. On-going evaluation involves continuous analysis and assessment of a project's operation and its impacts. It should thus be oriented toward problem-solving. To be effective, the project design should be dynamic in the sense that the project should be able to respond to the changing needs of management and to resolve new problems as they are identified.

An important concern of evaluation activities is an assessment of the project's context -- the socio-economic environment in which the project is intended to operate. An understanding of the context is essential in order to match a project's objectives with those of the intended groups of beneficiaries, and to modify the objectives or the scope of a programme if it becomes necessary. (French, 1985).

Evaluation of project effects, impacts, and context is based on such things as dynamics of production and consumption of wood products, perceptions of wood scarcities and responses to them, patterns of social organization with respect to tree planting and management, commercialization of wood products, and prices of wood products in various markets. Obtaining such information will usually involve field studies and surveys carefully designed to avoid over-collection of data and with information always disaggregated by gender (Chambers, 1978).

Terminal evaluations, carried out at the end of a project, and ex post evaluations, carried out some years after the project's completion, assess the achievement of longer term objectives and goals. These evaluations are intended to clarify

some of the lessons learned and to provide guidance for future projects and activities.

The relationship between project management and those responsible for monitoring and evaluation is important. An administratively separate monitoring and evaluation unit could approach its task with critical independence. At the same time, since a major purpose of monitoring and evaluation is to assist project management in operating more effectively, it is increasingly recognized that close collaboration is very desirable (FAO, 1985).

Responsibility for this type of monitoring and evaluation may need to be placed at a relatively senior level of the bureaucracy of a project's management. Influence, status and freedom to pass on both negative and positive information to key decision makers is often essential.

In contrast, for some evaluation functions, dispassionate involvement is highly important. The tendency to overstate local achievements is a recurrent problem and is especially so when achievements fall far short of targeted goals. These dual needs reinforce the notion that monitoring and evaluation activities should draw on multiple and overlapping sources of information.

Local conditions and constraints on data collection must also be taken into account. In Nepal, for example, written communications are understood to to be legal documents for which the writer can be held accountable, while the completion of systematic monitoring reports is inconsistent with the traditional administrative culture which relies, for the most part, on verbal communication. Further, field personnel worry that figures reported to the monitoring unit could be used for auditing purposes in which discrepancies could be attributed to the misuse of funds (Bhattarai and Campbell, 1985).

Because of the innovative nature of participatory forestry projects, it is crucial that continuous flow of information and its assessment be made an integral project management tool. Differences in styles of management, in project objectives, and in intended beneficiary groups will call for systems with different emphases and focuses. Adequate monitoring and evaluation systems of a more participatory nature have yet to be developed. Nonetheless, local participation will be a necessary component in programmes designed to increase local self-reliance in resource management.

Monitoring and evaluation by itself is not a solution to problems which may be encountered during project implementation. However, they can be very effective tools if a project's management is able to pursue responsively and flexibly alternative strategies. Many of the problems with farm and communal forestry which are only now becoming apparent could have been identified and resolved at an earlier stage if they had been more effectively monitored and evaluated.

Chapter 9

Maximizing the effectiveness of rural tree planting programmes

A supportive institutional environment in which community forestry programmes take place is critical for their success. At the same time, lack of appropriate institutional strength often poses the greatest difficulties for successful project implementation. Organizations and institutions shape and limit the development process, ideally in a way that simplifies problem solving and that promotes the general coordination of activities.

Organizations and institutions take several forms:

- formal public sector bodies at the national, regional, and community levels;

- local organizations including such groups as cooperatives, farmer's associations and tenant leagues, as well as locally elected governments and grassroots political organizations which very likely have linkages to levels of organization above the village community;

- private sector bodies that deal with production, processing and trade in goods and services (Chandrasekharan, 1983).

If programmes are to be successful, they require sympathetic coordination among rural people, the foresters, extension agents and others involved in implementation, as well as with the donor agencies. Yet the incentives which motivate these different groups are different and may even be conflicting rather than complementary and supportive.

Discussion is essential

9.1 The Role of Forest Departments

Forest Departments have historically been the organizations responsible for implementating forestry programmes. Characteristically, however, except for policing, protection and revenue collection, government forest departments have had little interaction with rural people in the past. Involvement of forestry services in rural and commmunity development, agroforestry, extension and programmes for employment and income generation is generally new and requires different roles than those forestry departments were designed to play. The change in emphasis required is one from executive to supportive functions.

The transition of forestry departments from their earlier role can be quite necessary before cooperation can begin. In Pakistan, for example, farmers were reluctant to become involved in a rural forestry programme because the Forest Department was viewed with suspicion and distrust. When the project was initiated, over 50,000 forest offences were pending in the courts, which meant that one out of six families was involved in disputes with the Forest Department (Cernea, 1981). In parts of India, Forest Department personnel "evoke fear and not respect or affection" (Srinivasan and Ramadoss, 1983).

The perception that rural people have about particular institutions which may be involved in project implementation will often be crucial if any kind of collaboration can be expected. Governments have selected different organizational strategies for implementing rural tree growing activities, and the administrative framework of these strategies has varied widely in complexity and scope.

In some cases, changes in the administrative structure of a forest department have been tried as a means of changing the negative rural perception of its role. In India, many of the state forest departments have added new and highly visible divisions for social forestry. In other cases, foresters may be attached to other services. In Senegal, foresters without uniforms and guns are attached to regional multidisciplinary development offices as well as to parastatal development organizations.

It is not uncommon that the responsibility for reforestation or for other rural forestry activities is shared among a number of public sector organizations. In Kenya, independent rural forestry activities are administered by the Ministry of the Environment and Natural Resources (through the Forest Department), by the Ministry of Agriculture and Livestock Development and by the Ministry of Energy and Regional Development. Although this approach has been effective for the most part, there is a danger that a lack of inter-ministerial coordination may result in a duplication of efforts.

It is much less common for responsibilities for rural forestry activities to be removed from agricultural or environmental ministries altogether. In the Republic of Korea, however, when the village forestry programme was initiated, responsibility for forestry was shifted to the Ministry of Home Affairs. The move was a pragmatic one which recognized that reforestation should be dealt with within the framework of the national community development programme, Saemaul Undong. This change gave forestry priority and funding at the local government level.

New goals for forestry also require introducing new systems of professional education for both forestry officers and extension personnel. Alternatives to conventional curriculum need to be developed which reflect the skills required in an extension-oriented service. Course offerings must include practical field training directly related to future job responsibilities.

A number of formalized training programmes in community forestry have been established and can be a valuable means for broadening the training experience of forestry officers. The Centre for Forestry Education, Research, and Development of the University of the Philippines includes courses in rural sociology, education and community planning as part of its forestry curriculum. Kesetsart University in Thailand is developing a major in community forestry.

Special training is needed for community forestry

The question of career prospects, however, can remain a limiting factor until the institutions also reflect these changes. Most foresters are recruited into institutions which place a high priority on technical skills required for producing trees and conserving existing woodstock resources. While this is no longer universally the case, technical skills and a pro-conservation orientation usually continue to determine the career success of foresters. In practice, this means that ambitious foresters will gain technical expertise at the expense of social science expertise. They will also often prefer the management of existing or new forests to involvement in social forestry activities. Social forestry jobs have seldom been seen to lead to important promotions, positions of power within the forestry department or to improved salaries or benefits.

For creating integrated services, it has often been difficult to recruit talented individuals with backgrounds in the social sciences and other fields. For non-foresters, forest department jobs may appear to offer insecure employment with little, if any, opportunity for promotion.

It is crucial that forestry departments assign qualified men and women foresters, social scientists and others to implement rural forestry programmes and give them attractive incentives for staying there. Until community forestry is as remunerative for all those concerned as conventional forestry is, it will never succeed.

Programmes must incorporate management tools and feedback mechanisms which allow senior project management to identify individuals who are successful at community forestry. Projects must reward individuals who can effectively liaise with local people and who can involve them in programme implementation.

9.2 Local Organizations

Increasing recognition of the essential role of institutions in rural development has lead to the awareness that often local

organizations are the key to success, while the lack of local organizations is the chief barrier to effective rural development. The types of local institutions that have filled this essential role have often been informal; some were formed at the initiative of groups within communities or villages that have common interests in the use of tree resources and felt the need for some kind of institutional framework (Chandrasekharan, 1983).

Guatemala sawmilling cooperative

In Guatemala, some forests are managed cooperatively. Small forest industries have been established, and the work of the cooperatives has included additional activities such as the construction of roads to improve access to markets and to open up areas for reforestation. In El Salvador, the government has purchased a large estate and turned control of it over to the people who had been working there. Women have organized a cooperative to plant and manage trees for fruit and fuelwood production. In Gujarat, India, a number of marketing cooperatives have been formed in Bhavnagar District in order to market smallholder timber production more effectively and to limit smallholders' exploitation by middlemen.

Such organizations can play an extremely valuable role in implementing rural tree planting programmes. They can motivate people and can often bridge the gap between rural people and the forest department. Non-governmental organizations can also be an important intermediate channel for communication both through vertical and horizontal linkages, and may help to contribute to the institutionalization of community forestry.

There is a range of skills, goals and organizational strategies among NGOs. However, many of the best are noted for their ability to work directly with small communities of the poor to remain flexible and responsive to local situations and to economically use available funds. Many of the forestry service bureaucracies are not structured to do these things. Small tree growing programmes may be more successful when forest services offer technical support while NGOs implement the activities with the residents.

In the Ranchi area of Bihar, India, a consortium of local voluntary organizations was formed in 1977 to promote community forestry. This consortium made contacts with the Chief Conservator of Forests who responded positively by quashing all pending cases of forestry violations by the people in the area. The local situation has since improved remarkably. Local people are now enthusiastically collaborating with the Forest Department in tree planting. Seedling survival rates have been especially high, and the outlook for the future appears promising. The consortium was effective in part because participating NGOs had

different areas of competence which complemented each other and in part because they had local, national and often international credibility. The result was an integrated approach toward environmentally sustainable development which has been officially recognized both by the Forest Department and by the Central Government (Basu, 1984).

Other NGOs have undertaken tree planting activities in order to supplement the work of the public sector in promoting reforestation. In 1977, the National Council of Women of Kenya initiated a major tree planting programme called the "Greenbelt Movement." Corporate and individual sponsorships of the Greenbelt Movement are actively sought. Individual tree sponsorships, costing around $7 per tree, guarantee that a tree will be planted and maintained.

Kenya Green Belt Movement - an NGO initiative

When 1 000 trees have been planted in a single setting, usually close to villages or in shelterbelts in arid areas, the site is inaugurated as a Greenbelt, and is signposted and publicized. The Greenbelt Movement especially promotes planting indigenous tree species. By the end of 1982, approximately 200 Greenbelts had been established (Buck, 1984).

In India, a similar strategy has been pursued by the Society for the Promotion of Wastelands Development. The Society, a private organization, was established in part to promote the development of links between possible financing institutions, local communities and the public sector. Reforestation is undertaken with local involvement and with adequate financial and technical resources. The Society encourages individual and corporate contributions as well as contributions from foreign donors.

Private voluntary organizations can be a useful mechanism for directing foreign assistance toward the forestry sector. In Haiti, where there has been a successful linkage between several "Northern" NGOs, including CARE and the Pan American Development Foundation (PADF), with local voluntary agencies in a tree planting programme, this effort has been partially financed with bilateral assistance from the United States and Switzerland.

These international NGOs have entered into a number of agreements with local NGOs, primarily church groups and local community organizations, to carry out local extension. Seedlings, provided to these NGOs through centrally-operated nurseries, are distributed by community organizations to local farming families, although local nurseries are beginning to develop. By the end of the 1983 rainy season, 150 local NGOs had become involved.

A number of voluntary organizations have been quite successful in initiating tree planting programmes, relying only on local resources. This has been especially true in many parts of India where NGOs have assumed a vital role in promoting reforestation. Many religious and other NGO groups are now focusing directly on forestry. The Anand Niketan Ashram in southern Gujarat, for instance, has been involved in promoting the development of tree growers' cooperatives since 1980. In the first year of the Ashram's work, it planted over a million seedlings with a survival rate of 80 to 90 percent. Currently, it is making plans for starting over 300 nurseries with a combined capacity of 10 million seedlings a year. The Ashram itself was established nearly 40 years ago, and so is able to take advantage of its good reputation and extensive involvement in local community development activities (Mishra, 1982).

Schools can often play a role not unlike that of NGOs in promoting tree planting. Enthusiastic teachers can have a considerable influence over the children they teach. They also tend to have a high standing in their villages. Schools provide a focal point within the community.

In Gujarat, school nurseries and tree planting activities have been initiated on a large scale. In addition to their educational value, these activities raise income for the school. In Tanzania, some primary schools in the Dodoma, Arusha and Singida regions have managed to cover areas previously completely bare of trees with plantations as large as 10 hectares (Kaale, 1982).

School children - trees for their future

The use of NGOs as intermediary organizations has the further advantage of directing financial and technical resources toward the rural forestry sector without many of the constraints of politically "tied" bilateral development assistance. Some NGOs are often able to manage and implement the dispersed types of projects which aid agencies may be unwilling to administer.

NGOs frequently need technical support from forestry departments; forestry departments frequently need strong support in local communications NGOs. It is unfortunate that often there has been a polarisation between government and non-governmental organizations in which support for one has implied opposition to the other. In the case of community forestry programmes, such automatic prejudices have no useful part to play.

Figure 6 Field extension materials from Nepal

Field extension materials

1. Community forestry extension flip-charts: for use by Divisional Forestry Officers and Community Forestry Assistants in explaining the programme to villagers; also used in training CFAs and Panchayat Forestry Foremen and Watchers.

2. Community forestry extension booklet: the extension flip-charts in booklet form, used as reference for staff and given to village leaders, schoolteachers and other literate villagers.

3. Posters: a variety of them, to create awareness and deliver brief messages on community forestry; displayed in hill villages and towns.

4. Nursery signboards: mark the location of local nurseries and indicate that free seedlings are available.

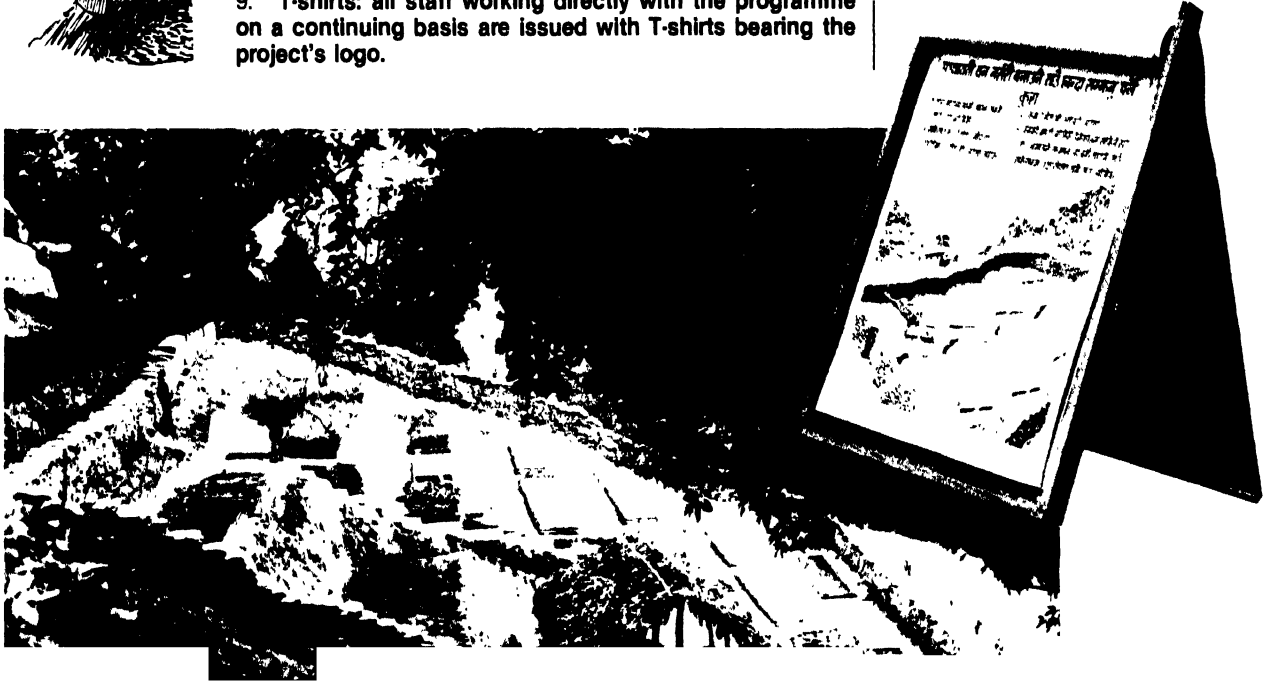
5. Film-strips, for central-office and district use: one on women's role in community forestry and another on construction of simple brushwood check-dams.

6. Schools publication: a multi-purpose folding chart aimed at village teachers, to enlist their help in promoting community forestry among children; can later be displayed as a poster on school premises.

7. Radio programme: a weekly 15-minute programme on community forestry, broadcast from Kathmandu, intended primarily to disseminate news of field activities and create a "bandwagon effect" for the community forestry programme.

8. Logo for the project: used on all printed materials.

9. T-shirts: all staff working directly with the programme on a continuing basis are issued with T-shirts bearing the project's logo.



9.3 Extension Efforts

Generally speaking, extension is a process through which people become familiar with new knowledge and skills of direct relevance to their lives, and through which government support services can learn about local priorities and needs. Extension services can also provide planting materials, supplies and tools when lack of these items has been identified as a constraint to local tree planting. As an information process, extension must follow the strategy of first identifying the real problems and their causes, then selecting those problems which can in some way be addressed by information, and only then design ways to get that information to the right person in an effective manner.

Does the forestry extension worker also listen?

If, for example, the constraint is a restrictive policy or a lack of some support service, the information must be directed toward those in policy and management positions. No amount of clever design or publicity campaigns directed toward the rural poor will change tree planting practices if the constraint deals with lack of tree-use rights.

Again, the problem of bush fires is often approached only on the basis of information on how to extinguish fire, without first learning the causes. When fires are set in order to produce new grass shoots for fodder, providing information on alternative ways to produce fodder may be much more effective than fire control techniques.

The issue of making information available to the right person is the cause of certain project failures when only men are given new information in areas in which women are also responsible for resource use decisions. The same effect is caused when meetings, which may be theoretically open to everyone, are held during periods of the day when women are not free to attend.

Often, extension is essential for maximizing the effectiveness of a rural development activity. It sometimes suffers, however, because of an assumption that rural people need to be persuaded to undertake alternative development strategies -- that development is somehow a process that is done "to them" instead of by and with them.

A major constraint in most extension activities is the difficulty of getting extension agents to really listen to rural people, take what they say seriously and work with them. The tendency in many extension services is rather to stress the transmission of a "technical package" from the agent to the farmer or pastoralist. Despite great emphasis on collaboration with residents, most extension agents still assume they know more about the activities in question than do rural women and men. At the very least, they may believe that technical packages developed by experts should not be modified.

From the perspective of the farmer, who knows a great deal about his physical environment and about the kinds and quality of local opportunities and constraints, these "packages" will often seem irrelevant or ill-considered. They may not take into account technical, environmental, social and political limitations which rural people face. The ideal programme, on the other hand, will involve a creative response to rural dwellers' interests and concerns, building upon their insights and enabling them to work toward an effective set of environmental and tree management strategies.

Extension workers must have listening skills and a sense that they can learn from residents information needed to make them more capable as extension workers. They should be trained as generalists, familiar with technical and social issues. They should be able to recognize when their own knowledge is inadequate and call on more qualified experts.

Also it is important that systems are structured so that effective extension workers know that they will be, and in fact are, appreciated, supported and rewarded. The organizational strategy for supporting extension activities has been approached differently in various countries.

In Nepal, rural forestry extension is undertaken by the Community Forestry and Afforestation Division of the Department of Forestry. Extension is carried out primarily by Divisional Forestry Coordinators (DFCs) who have territorial responsibilities for all forestry activities in their areas and by Community Forestry Assistants (CFAs) who carry out only community forestry activities and who have no policing responsibilities.

Before a village applies to join the community forestry programme, the DFAs explain the programme to leaders in the community. The intention is not so much to "sell" the programme to the village as it is to determine the views and attitudes which might affect the success of a community programme. After a village has committed itself to involvement, CFAs and DFCs subsequently provide advice about good sites for tree nurseries and community forests and about how the community might go about preparing a management plan for the future. In the end, however, all decisions must be jointly approved by the local forest committee, the panchayat, and the Forest Department (Pelinck, et al,1984).

Quite often, forestry extension activities can be incorporated into the framework of existing agricultural extension programmes. This approach has advantages as well as disadvantages. The primary advantage is that there is often already an established network of agricultural extension workers. It may be difficult and undesirable to draw the line between growing agricultural crops and growing trees, especially in tropical areas. Agroforestry deals with successfully combining the two sectors.

In Indonesia forestry extension was, until 1982, undertaken by a network of nearly 7 000 extension workers administered by the Agricultural Education, Training, and Extension Agency of the Department of Agriculture. Extension workers focused their efforts on long-term methods of cultivation which combine forestry and agriculture into an integrated agricultural production system (Atmosoedarjo, 1982).

The disadvantages of incorporating forestry extension into an agricultural extension service include the fact that extension workers are often already spread too thin to adequately cover conventional agricultural problems; their training may not include skills required in community forestry. Agricultural extension is geared toward finding short-term solutions to increasing annual production, since such major issues as long-term land and tree tenure are less critical in agricultural programmes.

Frequently rural forestry extension must focus on the entire village or community, while agricultural extension may involve just a few farmers who adopt improved methods of crop production. Forestry workers may have to be able to relate effectively to or even organize community groups and institutions. These types of skills are not usually required of agricultural extension workers. Foresters often have a specialized knowledge of silvicultural and forestry management practices which

agricultural workers might lack. Perhaps most importantly, by removing extension responsibilities from the forestry department, the opportunity for foresters to communicate directly with farmers about local needs and agroforestry possibilities is lost.

Extension services must be adaptive. Extension workers who are generalists must be able to draw on appropriate expertise as it becomes needed. There is no need to train every extension worker in the finer points of processing smallholder tree farming loans, but they must still be able to find out how to go about doing so should the need arise. This flexibility becomes even more important when the direction of a project changes. In Gujarat, for instance, as smallholders prepare to market their production, extension agents will need to be able to respond to requests for information about tapping potential markets, a need which was not considered in the earliest stages of project design when project goals were different.

Sometimes local residents can be effective extension agents when supported by the forestry service. In West Bengal, India, local farmers are employed as "motivators" and are selected on the basis of their potential influence in the community, as well as on their willingness to adopt new tree planting practices. In Haiti, a similar approach has been taken, and the local NGOs involved in tree planting hire "animateurs" from the local community of farmers to undertake extension efforts.

At the same time, great care may be necessary in selecting the local representative when adopting this approach. Strengthening those who are already in positions of local economic power may not help the poorer residents grow trees. In some cases, directing extension efforts at more progressive farmers has only widened the gap between the well-off and the poor. Farmers tend to communicate best with other farmers who are from similar social and economic backgrounds, and special extension efforts may be needed for each different socio-economic level within a community (Clark, 1982).

Farmers tend to communicate best with other farmers

The major issue for forestry extension, however, is how to empower rural people and to help them communicate effectively, while at the same time strengthening the ability of forest services and research institutions to respond supportively through a continuous two-way communication system.

9.4 Public Information and Programme Promotion

While planting trees may be an economically and culturally sound response to scarcity, and while public interventions may be

implemented in order to make the necessary resources available, the rural smallholder may lack the information required for taking advantage of such programmes. A survey of villages in Orissa, India, revealed that 80 percent of smallholder families had no notion that they could obtain seedlings and technical assistance for tree planting from the Forest Department. Tackling a lack of this kind of information can be fairly straightforward through publicity and promotional activities.

Means for spreading such information are as diverse as the settings in which they have been introduced. They include the use of promotional stickers, posters, messages on billboards, booklets, story tellers or singers, puppet theatres, film strips, movies, radio and newspaper advertisements, tree-planting festivals, national campaigns and political pronouncements. The effect of these types of activities can be difficult to gauge, but active programme promotion can be helpful.

In Tanzania, for example, a major publicity campaign was launched in 1980 based on the slogan "Forests are Wealth." The response was impressive. During and after the campaign, the Forest Department was swamped with inquiries about how one could obtain seedlings and technical advice. In 1981, seedling uptake from Forest Department nurseries in the Arusha region increased nearly five-fold (Kaale, 1982).

A similar initiative was undertaken in Gujarat starting in 1972 when the state government decided to take action to encourage tree planting. A publicity campaign was built around a month-long annual festival, popularly known as Vanamhotsava -- the Festival of Trees. This festival had been established in 1950 by the Government of India, but up until 1972 had been virtually ignored.

Frequent talks on various aspects of tree planting and farm forestry were broadcast on All-India Radio in Gujarati. The talks dealt with the direct and indirect benefits of tree planting, planting techniques, the availability of seedlings and technical advice, and investment costs and possible returns. Publicity materials such as posters and booklets were widely circulated. The combined effect of this publicity and an active seedling production and distribution programme appears to have been substantial. In 1971, only around 6.1 million seedlings were distributed; the next year, distribution reached 16.9 million seedlings.

The single most crucial source of information in most areas will, however, tend to remain the foresters themselves. In Gujarat, despite the massive publicity, a recent survey indicated that the primary source of information about community forestry activities is forestry officers (Bhatia, 1984). Programme promotion activities can help to publicize tree planting interventions, but the essential human contact between smallholders, forest officers and extension workers in the field is likely to remain the most valuable.

9.5 Finding Ways of Reducing Risk

Even if local institutions are able to assume an active role in encouraging rural forestry activities, and relevant technical advice and assistance is provided by extension and education programmes, there may still be some very basic constraints which will prevent smallholders from engaging in tree growing. As mentioned in Chapter 8, these constraints are largely a reflection of the farmers' perception of risk. Since ability to assume risk relates directly to affluence, in order to reach the poor, risks of loss must be minimized.

Many proposed tree planting activities involve actual or potential costs which minimum-resource farmers are unwilling or unable to assume. Programme planners can encourage smallholder involvement in farm forestry by directly or indirectly reducing these costs. Incentives can have the effect of spreading the smallholder's costs or of more closely matching the timing in the flow of costs and benefits. These types of incentives can take a variety of forms.

One especially important aspect of reducing risk is the certainty that the technical alternatives being suggested will work. If innovations have not been proven in that environment, farmers who test these new ideas must not be asked to assume risks which were previously born by institutions.

Working on a small scale, providing risk guarantees and being sure to differentiate between experimentation and demonstrations are all important. Where trees are grown for the market, developing stable market conditions for tree products can be an important means of reducing a farmer's risk. Pricing interventions are appropriate where wide fluctuations in supply and demand create an unstable market environment. At the same time, since these interventions have no long term utility for promoting efficient production, other initiatives are probably more sustainable.

Governments can provide incentives to the private sector to encourage development of wood-based industries. The Korean experience successfully capitalized on these types of activities through significant local market opportunities for trees and tree products. Improvements in marketing arrangements and in the transportation infrastructure can also help farmers tap potentially large markets outside the immediate zone. Formalized marketing structures may help protect smaller farmers unused to commercial dealings with wood merchants and felling contractors. These arrangements may take the form of marketing boards or farmers' cooperatives.

Lowering costs of tree growing can be an important way of providing incentives for smallholders and of reducing their risks. Subsidies are often a means of involving rural poor where benefits of tree planting may not seem obvious, especially where farmers must have an intermediate source of income before the trees are harvested and sold. Often these payments are considered advances on the eventual value of the tree crop.

In some cases, subsidies are paid when the trees are planted; in others, payment is made based on the number of seedlings which survive after a certain number of years. The intention is to provide an incentive both for planting trees as well as for protecting and managing them until they are well established. In Tamil Nadu, India, poor farmers are given as many as 500 free seedlings and are paid a cash bonus based on the number of trees which survive at the end of the first and second years. Often incentives are given where costs are borne by one group and benefits are shared by others, such as in watershed management activities.

Direct cash subsidies for planting trees are appropriate under a limited set of conditions. Programmes which have paid farmers to plant trees usually have other objectives as well, such as employment generation. In other schemes, "food for work" projects have provided a payment-in-kind for tree planting. Tree planting is not the primary objective, but is seen as a means to provide employment and improve local nutrition. Whether or not the trees survive after they are planted is incidental to meeting the primary objectives of many of these programmes.

Food aid - appropriate under certain conditions

Any programme which involves direct cash or food subsidies should be simple and easy to run. If there are long delays in assessing the number of surviving trees, or if the methods of claiming and receiving payment are too slow and cumbersome for the intended beneficiaries, these incentive schemes may be ineffective or may actually deter farmers from engaging in tree planting. Projects paying people to plant trees may affect neighboring areas where residents, learning of the payment scheme, may wait to be paid before planting trees they might otherwise have planted.

The need for cash incentives to plant trees should therefore be assessed carefully. In Haiti, a comprehensive programme which provided cash incentives based on the number of a farmer's surviving seedlings was found to be unnecessary. The prospect of financial gain from the trees alone was enough to encourage farmers to participate and the incentive scheme was abandoned. The dependency which incentive schemes engender in cases where they are not necessary is particularly unproductive in the long run.

In some cases, there may be a potential for introducing tax incentives to indirectly subsidize market-oriented farm forestry. In Rajasthan and Gujarat, profits from farm forestry are exempt from taxes. One of the major constraints to tax incentive

programmes is that they tend to benefit wealthier farmers because smallholders and subsistence farmers, for the most part, are not taxpayers.

9.6 Credit Schemes for Tree Growing

As with nearly any other agricultural crop, the availability of credit on appropriate terms can be an important incentive for smallholders to undertake farm forestry when they can eventually be assured of receiving an income from the activity. In effect, credit schemes help farmers to match more closely the flow of farm forestry's costs and benefits over time.

Even when fast-growing trees can ensure good returns over a short time horizon, financial inputs may still be needed to support a farmer until the trees are generating income. Credit may be needed to support the rural household, or it may be required to provide timely, necessary inputs into a tree planting activity.

It is unlikely that many commercial banks will be willing or flexible enough to undertake the burden of administering a programme of smallholder farm forestry finance. The PICOP loan programme, administered through the Development Bank of the Philippines, was able to coordinate an effective loan effort. However, a recent evaluation of the PICOP project discovered that, although a credit mechanism had been established to support the tree production, the timing of credit availability was such that the farmer was often unable to have access to enough capital at the time of heavy expenditure for harvesting.

Credit schemes can be of particular importance in enabling the participation of farmers on small landholdings. In Sudan, for instance, smallholders traditionally mortgaged their gum arabic production to merchants in return for high interest loans to purchase subsistence commodities. As part of its farm forestry programme, the government introduced regulated credit facilities to reduce the negative impacts of traditional credit schemes.

In many cases, however, individual farmers are not in a position to take advantage of any type of credit facility. They may lack title to the land they farm or may lack enough collateral to cover their request for credit. Farmers often place particularly high value on land ownership and are not willing to risk losing their property by using it as loan collateral. In these cases, special arrangements may be necessary, such as risk insurance, relaxing the requirement for collateral or providing concessional credit facilities. Farmers may be encouraged to associate themselves as groups of corporate creditors.

Where credit is available to a smallholder, it should be borne in mind that the risk of using it may not be justified. Other alternative public sector support mechanisms may be necessary to reduce the farmer's risks. These might include marketing mechanisms, price controls, technical assistance and extension (Arnold, 1983).

9.7 Seedling Distribution Programmes

An indirect means of encouraging women and men farmers to plant trees is by distributing seedlings free or at a subsidized cost. Once the programme has become popular, there should be no need for such incentives. Continued subsidized seedling distribution serves no particularly useful function and will only inhibit farmers from establishing their own nurseries.

The cost of seedlings, nonetheless, can be a constraint to the poor. One low-cost approach is to distribute seeds and planting instructions, as has been done with wide success in parts of Kenya.

Alternatively, inexpensive means can be found for distributing large numbers of germinated seeds. In Gujarat, farmers are encouraged to start their own tree nurseries, especially in areas which cannot be serviced by those of the Forest Department. Farmers are given bamboo baskets about a half meter in diameter and several centimeters deep in which around 2 000 eucalyptus seedlings have been germinated. Farmers can easily transport these baskets, and they transplant the young seedlings into larger containers at their homes. They are encouraged to sell transplanted seedlings to other farmers when there is a demand.

The willingness of farmers to plant seedlings is in part a function of their proximity to tree nurseries. In Nepal, most seedlings are taken by farmers who live within a half hour's walk from the nursery. In areas where transportation may be a problem, it would appear to be appropriate to have a large number of smaller and decentralized nurseries -- which could also serve as extension centers -- rather than just a few large ones.

The distance to the nursery is crucial

To assure that seedling distribution fits within the overall tree growing effort, it is crucial that farmer uptake is closely monitored and evaluated. In Nepal, a record was kept of the number of seedlings taken by men, women and children, and of the survival rates. Men took 72 percent of the seedlings and women only 3 percent, showing that more extension was needed among the women and/or that nurseries should be more responsive to women's needs. Survival rates were lower in seedlings taken by children, again showing another type of follow-up which was needed.

Figure 7 The Korean Village Forestry Support Programme

It is obviously not possible to identify all the factors responsible for the successful implementation of Korean village forestry. Many of them are related to subtle changes in moods, atttitudes, and emphasis in the implementation of policies. However, based on review of available information and understanding, the following factors can be identified:

(a) A broad-based approach was used, through the national Saemaul Undong self-help movement, to achieve improvements in a great number of conditions directly influencing rural welfare.

(b) An incremental or a step by step approach was used which put emphasis on results rather than abstrct ideals. Realistic village potentials were stressed in each stage of development (e.g. seedling production was concentrated in village level nurseries to help villagers develop a better appreciation of trees and tree management, and to raise villagers' income).

(c) There was a blending of top-down and bottom-up planning and emphasis was placed on cooperative action between government and private citizens (e.g. through the relationship between the forest service and the Federation of Village Forestry Associations).

(d) There was a recognition that longer term goals could not be achieved without also putting emphasis on short term gains in income and welfare (e.g. by concentrating on species such as chestnut, which produce income early, and on income generating activities such as mushroom production which could be introduced into the plantations)

(e) Emphasis was put on research and development of appropriate technology (which focussed on the few, well known species with proven performance ability).

(f) Emphasis was put on provision of adequate technical assistance and extension of appropriate technology to users.

(g) Thorough logistical planning was used to assure timely delivery of materials and technical services (e.g. planting stock, fertilizer and technical advice).

(h) Appropriate and timely financial subsidies and access to resources were given to villages. Such aid was tied to a self-help attitude to prevent problems of increased village dependence on outside support. Among other things, emphasis was placed on reinvestment of some of the gains from projects

(i) Strong, clear laws and regulations were developed to define appropriate responsibilities needed to achieve results. It was recognized that results could only be achieved if villagers themselves participated in policing activities and exerted peer group pressure to prevent abuse of resources.

Source: Gregersen, 1982

Surveys can establish the desirability of particular types of trees, whether or not free seedling distribution encourages smallholder participation or whether agricultural lands are being used for tree growing. Monitoring and evaluation is an essential tool which allows management to adjust the course of the project when problems appear and which provides a sound basis for policy decisions.

9.8 The Aggregate Support Programme

These final two chapters have dealt with particular components of the process of planning and implementing programmes to encourage and support tree growing by rural people. Important though each of these is in itself, it is likely to prove effective only if it forms part of a set of measures which in aggregate adequately addresses all the aspects of tree growing which may need support from outside the community. The rural poor, living as they usually do at the very margins of existence, need to avoid any change which, though it might improve their situation if it functions as expected, would leave them even worse off than before if it does not. A programme to support tree growing is not likely to provide adequate protection against such risks unless all its component parts are sound.

Because tree growing is often embedded in complex systems determined by the ways in which people organize their lives and use their land and other resources, its evolution and strengthening may require action in several areas. Figure 7 indicates the range of different measures that provided support to the successful village forestry programme in the Republic of Korea described in Chapter 5. They include changes in forest and land use policy and in supporting legislation, radical alterations in forestry administration structures, research to identify sound technical prescriptions and new sources of income, development of an effective delivery and extension system, strengthening of village level capabilities, and provision of new sources for funding financial incentives and subsidies.

Not all programmes will need such broad ranging and radical measures. Some people who are already cultivating trees only need help in the form of providing planting stock of new species, or in raising the productivity of their systems to meet growing pressure on the land. But no matter what level of assistance is needed, it is essential that in aggregate it effectively address all the different dimensions of the problems which the people being assisted confront in their tree growing activities.

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ANNEX I

A BRIEF GUIDE TO THE AGROFORESTRY LITERATURE

Periodicals

Currently there are two journals providing regular, up to date coverage of agroforestry: Agroforestry Systems (published in cooperation with ICRAF by Martinus Nijhoff/Dr. W. Junk, POB 566, 2501 CN, The Hague, Netherlands) and The International Tree Crops Journal (published in cooperation with the International Tree Crops Institute by A.B. Academic Publishers, POB 97, Berkhampsted, Herts, HP4 2PX, England). The Nitrogen Fixing Tree Research Reports contain much useful information on agroforestry tree species (published by the Nitrogen Fixing Tree Association, POB 680, Waimanalo, Hawaii, USA). The Commonwealth Agricultural Bureau Forestry Abstracts are another source of regular information on agroforestry.

General Concepts and Regional Overviews

For the historical roots of agroforestry, see Smith (1950) for tree crop horticulture, King (1968) for forestry, and Bene et al. (1977) for a seminal statement of the need for integrated agroforestry. For a more recent and comprehensive assessment of the scope and institutional context of agroforestry research see Lundgren (1982). ICRAF has published the proceedings of a number of international meetings on agroforestry (Mongi and Huxley, 1979; Chandler and Spurgeon, 1980; Hoekstra and Kuguru, 1983) which are now out of print, but are available at libraries or in microfiche from ICRAF. Descriptions of regionally important systems are contained in CATIE (1979), ICAR (1981), MacDonald (1982), Hecht (1982), Weber and Hoskins (1983), NAS (1983), Olofson (1983) and Schirmer (1983) among others. Chambers (1984) has highlighted the importance of agroforestry for low-resource farmers and Raintree (1983) has described an adoption-oriented strategy for research. For bibliographies see Majisu and Labelle (1982) and Aterrado et al. (1982).

Agroforestry Science and Practice

For treatment of more technical aspects of agroforestry, see Huxley (1983), Cannel (in press), Nair (1984) and various ICRA Working Papers. The Agroforestry Systems journal carries a regular series of system descriptions from ICRAF's Agroforestry Systems Inventory, along with other descriptive and experimental reports of varying technical levels. The NAS (1980, 1983a) publications provide useful information on multipurpose trees and Burley and Carlowitz (1984) report the deliberations of a recent international workshop on multipurpose tree germplasm.

Agroforestry Methodology

For assistance in the identification and development of promising agroforestry systems and projects, various guidelines and resource materials relating to ICRAF's "Diagnosis and Design" (D&D) methodology are available (CIRAF 1983a, 1983b; Raintree, 1984; Huxley and Wood, 1984; Rocheleau, 1985). D&D case studies are regular additions to ICRAF's Working Papers series, along with accounts of land evaluation (Young, 1984) and economic methods in agroforestry (Hoekstra, 1985; see also Arnold, 1983 and Raintree, 1983). Huxley (1984) has compiled a manual on the exploration and assessment of multipurpose trees.

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